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Dimensions of legitimacy and trust in shaping social acceptance of marine aquaculture: An in-depth case study in Nova Scotia, Canada

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ABSTRACT

A major challenge facing sustainable aquaculture governance are disputes raised by social conflicts, highlighting the need to better understand and incorporate social dimensions into more holistic planning and policy. This study applied an in-depth qualitative approach to investigate key drivers that influence social acceptance of salmon aquaculture, drawing from interviews in coastal communities in Nova Scotia, Canada. From interviews, four main perspectives towards the planning, management, and development of salmon farming emerged, revealing a complex discourse of conflicts and controversy. This study argues that social responses to aquaculture are driven by perceived legitimacy and trust of the sector. Conflicts over the perceived legitimacy of policies and processes emerged, including arguments around what motivates and informs decision-making and how participants are involved in decision-making processes. In addition, conflicting paradigms of knowledge and perceived fairness in engagement processes highlighted the need for transparency, communication, and relationship-building. Controversy over a diversity of perceived environmental and social impacts reflected nuanced perceptions of how aquaculture contributes to individual and community well-being. This study also found perceptions of legitimacy to be deeply intertwined with evaluations of trust in government, industry, and science, which is a key predictor of social responses. Understanding these perceptual factors, separately and with their interdependencies, can provide decision-makers with insights to guide their regulatory, operational, and engagement processes. Ultimately, this work can serve to facilitate a better understanding of the motivators behind public responses to salmon aquaculture which can help bring social considerations into more holistic aquaculture governance.

1. Introduction

Aquaculture, or the farming of fish, molluscs, crustaceans, and aquatic plants, is one of the fastest growing food sectors globally and contributes 50% of all production of aquatic animals for food (FAO, 2022). While aquaculture is often considered crucial for meeting rising food demands, it is also often considered a "wicked" problem for governance, which needs to manage a contention over diverse issues including ecological and socio-economic impacts and user conflicts (Osmundsen et al., 2017). In many parts of the world, commercial aquaculture for key species like Atlantic salmon (*Salmo salar*) has become scientifically and publicly controversial (Osmundsen and Olsen, 2017; Young and Matthews, 2010). While environmental challenges have long been the focus of aquaculture governance, disagreement and conflict across various groups in society have created challenges for effective aquaculture governance and industry development in many nations (Young et al., 2019). With increasing recognition of the desire to move towards more holistic management approaches like the Ecosystem Approach to Aquaculture (Brugère et al., 2018), there is an increasing necessity to consider social dimensions in aquaculture planning and policy (Krause et al., 2015). This recognition has in part given rise to a discourse about concepts such as social licensing, or more broadly social acceptance, of aquaculture (Mather and Fanning, 2019). While social acceptance research is already a well-established field in many resource sectors, there is comparatively little empirical work regarding the drivers and determinants of social acceptance for aquaculture. This study explores social acceptance drivers and aims to offer a better understanding of the dimensions of conflict and controversy related to salmon aquaculture. Specifically, this study explores the arguments and perceptions of individuals living in salmon farming communities in

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Atlantic Canada to investigate what contributes to opinions of aquaculture, whether good or bad.

1.1. The concept of social acceptance

Building from the definition provided by Upham et al. (2015), *social acceptance* (SA) reflects the response (including perceptions, attitudes, and behaviours) relating to a proposed or existing technology or socio-technical system, by members of a given social unit (e.g., country, region, community, organization). A related concept, social license to operate (SLO), takes a primarily industry-focused perspective, focusing on the actions and strategies of companies to attain public support (Mather and Fanning, 2019). Therefore, SLO can be considered a component of the broader SA, which reflects the affective characteristics of perceptions and the responses. SA is a well-established field of study of environmental policy and practice, with international research on the acceptability of contexts (operations and technologies) including mining (e.g., Moffat and Zhang, 2014), energy production (Gaede and Rowlands, 2018), wind farms (Wüstenhagen et al., 2007), land use (Busse and Siebert, 2018), forestry (Ford and Williams, 2016), and wildlife conservation (Stankey and Shindler, 2006). In a policy setting, social acceptance refers to the broad acceptance of an activity by a range of groups across multiple scales, a combination of interrelated aspects of market acceptance, socio-political (or general) acceptance, and community acceptance (Wüstenhagen et al., 2007; Upham et al., 2015). Social acceptance also has a more psychological definition that reflects a judgmental process by which individuals form opinions about current operations and judge whether they are favourable considering other alternatives (Brunson, 1996). These definitions reflect more recent discussions in the literature, where social acceptance has been argued to be not an outcome, but a complex and dynamic process (Wolsink, 2018). Furthermore, these definitions highlight a behavioural component of SA and underscores a suite of factors that influence judgements. Therefore, social acceptance is arguably a useful framing to explore societal conflicts and perceptions about aquaculture, approaching the examination of perceptions from multiple perspectives, acknowledging multiple actors and scales of the issue.

Social acceptance research broadly seeks to understand the perceptions, opinions, and attitudes of people, and how they influence people's behaviours. The distinction between social acceptance and its associated terms can be unclear in the SA literature (Busse and Siebert, 2018) and warrants definition. In the context of applying SA concepts to aquaculture, *perceptions* reflect the general way an individual understands aquaculture or an aspect of aquaculture (for example, perception of risks and benefits). Related to perceptions, *opinions* reflect the beliefs individuals have formed on a particular aquaculture topic. *Attitudes* describe an individual's negative or positive evaluations of an issue or topic concerned with aquaculture. Attitudes influence *behaviours* about aquaculture, which in this study are described as the actions individuals take regarding aquaculture, or the outward expression of attitudes. In this way, this paper separates attitudes from social response, the latter referring to the behaviour to support or oppose aquaculture.

An important part of understanding social acceptance relates to analyzing factors influencing positive and negative attitudes toward aquaculture, and how those factors contribute to individuals' behaviour to support or oppose aquaculture. Behaviours are complex, and likely a result of various intricate interactions between multiple factors, but often invoke normative judgements about operations. Therefore, value judgements regarding trust and legitimacy are often incorporated into traditional models of social license defined in resource and energy sectors (Moffat and Zhang, 2014; Thomson and Boutilier, 2011). Suchman (1995) defines legitimacy as "a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs and definitions". When used to evaluate political systems, legitimacy is considered across three governance domains, that is normative evaluations of governance inputs, throughputs, and outputs (Schmidt, 2013; Taylor, 2019). Input legitimacy is based on perceptions related to the procedures, processes, and policies that feed into decision-making practices. Comparatively, output legitimacy relates to the outcomes of policies and procedures. Finally, a third dimension recognizes throughput legitimacy as the ways that people are involved across the policy process, involving dimensions of consultation and engagement. In this way, the concept of legitimacy operationalizes social acceptance as embedded within particular social contexts and draws in aspects of values and beliefs (Zimmerman and Zeitz, 2002; Washington and Zajac, 2005). Likewise, this research posits that trust and legitimacy will be central elements of social acceptance.

1.2. Social acceptance for salmon aquaculture

Community acceptance (the focus of this study) is an important aspect of SA and refers to the acceptance by local stakeholders, particularly residents and local authorities (Wüstenhagen et al., 2007). Studies across resource and technology sectors often recognize the importance of contextual factors like experiences and values, which are highly place-specific, on social acceptance (Kim et al., 2014; Wiersma and Devine-Wright, 2014). Therefore, an important aspect of SA unfolds at the community level, reflecting a localized process mobilized by local stakeholders (Wüstenhagen et al., 2007). Community acceptance is particularly relevant in discussions about ocean-based salmon aquaculture, where strong local opposition has emerged in many places around the world. Existing acceptance research for salmon aquaculture has predominantly explored perceptions as expressed in media discourses (Cullen-Knox et al., 2021; Kraly et al., 2022), public polls (Freeman et al., 2012; Hynes et al.; 2018), or market research (Whitmarsh and Palmieri, 2011). Community based research has focused on descriptive accounts of stakeholder and community concerns (e.g., Mazur and Curtis, 2008; Salgado et al., 2015), rather than investigating the drivers to inform broader frameworks of social acceptance. Much existing work has emphasized an important role of contested scientific information and varying perceptions on the environmental risks and impacts from aquaculture on the debates around the sustainability and acceptance of salmon farming (Osmundsen and Olsen, 2017). In addition, acceptance may depend on the ability of aquaculture to meet social and economic demands (e.g., employment, recreation) (Kluger et al., 2019). Further, trust, relationships, and interactions with local companies and governments have been strongly linked to social acceptance (Segreto et al., 2020). Finally, governance factors, including industry regulation, transparency, and stakeholder participation have been important in explaining increasing polarization in attitudes towards salmon farming (Cullen-Knox et al., 2021; Salgado et al., 2015). While frameworks to model SA have been established in other resource sectors, it is not well understood whether models can be applied to aquaculture settings. Existing work on SLO offers a starting point, but the need for SA framing for aquaculture conflicts is eminent. Furthermore, research investigating how groups of individuals make social acceptability choices and what drives those behaviours is becoming increasingly critical to wider discussions about sustainable aquaculture (e.g., Krause et al., 2015; Mazur and Curtis, 2008).

In recent years, research has begun to consider the concepts of trust and legitimacy for analyzing complex social conflicts and exploring social acceptance of the aquaculture industry and its governance (e.g., Bjørkan and Eilertsen, 2020; Sønvisen and Vik, 2021). While this study does not provide an empirical measurement of legitimacy and trust in terms of social theory, these frames provide useful to organize emergent themes across case study areas. Furthermore, framing around legitimacy can encompasses aspects of intergroup relationships, experiences and expectations, perception of risks and benefits, and perceptions about governance that emerge in aquaculture conflicts around the world.

1.3. Aquaculture in Atlantic Canada

In Canada, salmon farming has long been a controversial issue, with competing arguments and claims made by governments, stakeholders, and residents (Young and Matthews, 2010). In Atlantic Canada, governments have supported aquaculture development since the 1980 s, seeing opportunities for rural economic development, especially in the face of declining employment from fisheries and forestry (Young and Matthews, 2010). Salmon aquaculture in Nova Scotia has grown in both production and value since the 1990 s. Favourable natural environments around the province, as well as easy access to international markets, have made Atlantic provinces like Nova Scotia prime areas to support an increased industry (ACOA, 2004) and an untapped opportunity for coastal and rural economic development (e.g., Ivany et al., 2014). Despite a five-year moratorium on aquaculture farms in Nova Scotia between 2013 and 2017, regulatory and operational changes prompted a restored interest in the expansion of the industry. Since the moratorium was lifted, the province has received several applications for site expansions, installation of new sites, and exploring options for new companies in the area.

Yet, conflicts and criticisms among community, environmental, and interest groups have accompanied the growth of the salmon aquaculture industry. Expansion of the industry has been met with local concerns among residents, fishers, and environmental groups (e.g., Walters, 2007). For example, organized advocacy groups have mobilized campaigns, organized events, and petitions against open-net pen salmon farming. Concerns over the environmental sustainability of aquaculture, including concerns related to marine benthic habitat, fish health, and welfare, and risks to wild fish from disease and salmon escapes have contributed to public appeals for major overhauls of Nova Scotia's regulatory system (e.g., Doelle and Lahey, 2014). These conflicts have captured substantial media attention, reflecting a growing controversy around multiple issues (Weitzman and Bailey, 2019). As a result, potential salmon farming expansion in the province has set a platform for a renewed interest in social impacts and conflicts between government, industry, and social goals. Subsequently, salmon farming has been a primary sector in Atlantic Canada exploring societal perceptions and attitudes (e.g., Flaherty et al., 2019; Maxwell and Filgueira, 2020; Trueman et al., 2022).

Aquaculture governance in Nova Scotia can be challenging, representing a patchwork of regulations and systems across departments and scales (Doelle and Saunders, 2016). At the federal level, the *Fisheries Act* provides the overarching framework for environmental assessment for aquaculture under the Department of Fisheries and Oceans (DFO). Through a memorandum of understanding, the provincial Minister of Fisheries and Aquaculture is given jurisdiction over the regulation and management of aquaculture operations within Nova Scotia, including administering aquaculture licences and leases. In the case of new, or amendments to, marine licences or leases, applications undergo an adjudicative process by a three-person independent Aquaculture Review Board. This process also includes provisions for public engagement, including the requirement of a public meeting during scoping and a public hearing no more than 30 days before the final decision. Regarding aquaculture, communities are only involved through formal engagement processes throughout the adjudicative process since municipalities do not have jurisdictional authority in the ocean, and consequently over marine aquaculture.

Conflicts around salmon farming in Nova Scotia, Canada, thus provide an opportunity to better understand community acceptance of aquaculture. This study explored perceptions and attitudes of salmon farming in three rural communities in Nova Scotia to investigate the key drivers and motivators that influence social responses to aquaculture. Through in-depth semi-structured interviews, this work identified the primary perspectives among local stakeholders ranging from opposition to support for the industry. Thematic analysis of interviews revealed key factors around legitimacy and trust responsible for differing perspectives. The present research adds to existing social acceptance literature by not only defining the key perceptions, but identifying the motivations and perceptual drivers that shape community attitudes towards aquaculture. The findings from this research can lead to a better understanding of the conflicts and arguments responsible for attitudes and how they manifest. In addition, this work can supplement existing conceptual models of social acceptance and contribute to developing frameworks to explain how public response to aquaculture unfolds in communities where the industry is present.

2. Methodology

2.1. Research design and data collection

This study applied a grounded theory approach to understand what motivates and shapes social responses to aquaculture. This study was carried out with ethics approval from Dalhousie University (REB#2020–5071). Applying a qualitative approach drawing from thematic coding of interviews, the objective was not to provide empirical measures of what influences attitudes, but rather to analyze the perceptions expressed through in-depth interviews to better understand the underlying reasoning.

Semi-structured interviews were carried out between May and October 2020, with 24 participants in three salmon farming areas in Nova Scotia: Digby (n = 9), Liverpool (n = 7), and Shelburne (n = 8) (Fig. 1). Minimum sample sizes for qualitative research generally range from 10 to 50 individuals depending on the research type and objectives (Creswell and Creswell, 2018). A sample size of 20–30 was considered ideal for the grounded theory research approach in this study and to allow adequate participation across study areas, although the search for additional participants ended when it appeared through analysis (see section 2.3) that theoretical and thematic saturation had been reached. Saturation was attained as repeated concepts and themes became apparent as interviews continued, suggesting it was unlikely substantially new or different ideas would emerge. The study areas selected all comprise rural coastal communities in western Nova Scotia, where vocal conflicts against open-net pen salmon farming have captured media attention and manifested in the formation of active anti-salmon farming groups. This study applied a purposeful sampling of participant selection (Suri, 2011) to identify individuals with distinct experiences, views, and interests in aquaculture. Participants were selected that had both interest and knowledge about salmon farming in their area, to a degree they would be able to express their opinions on the topic. This involved interviews with individuals across a range of stakeholder groups that may be interested in, or affected by aquaculture operations in their area, including residents (n = 8), local (municipal) government officials (n = 6), members of community and environmental interest groups (n = 4), commercial fishers (n = 3), and tourism and business operators (n = 3). The scope of this study was to explore perceptions of aquaculture, as viewed from the perspective of those living in communities with aquaculture, but with no direct investment or involvement in the industry; as a result, the perspective of industry stakeholders (e.g., aquaculturists and industry groups) were not included.

All interviews were performed one-on-one over a phone or video-call and lasted about one and a half hours each. In depth semi-structured interviews asked the participants a standard set of questions to center the discussions (Appendix A) but were also broad and open allowing for follow-up questions, thus granting both consistency and flexibility during data collection (Creswell and Creswell, 2018). The analysis of attitudes drew from questions focused around two key areas: first, questions were centered around several potential factors that may influence and motivate participant responses to aquaculture, building from existing models of social acceptance, previous aquaculture perception literature, and capturing multiple aspects of legitimacy (Appendix A). A fundamental part of the legitimacy definition is that perceptions of acceptability based on a system of norms and values.

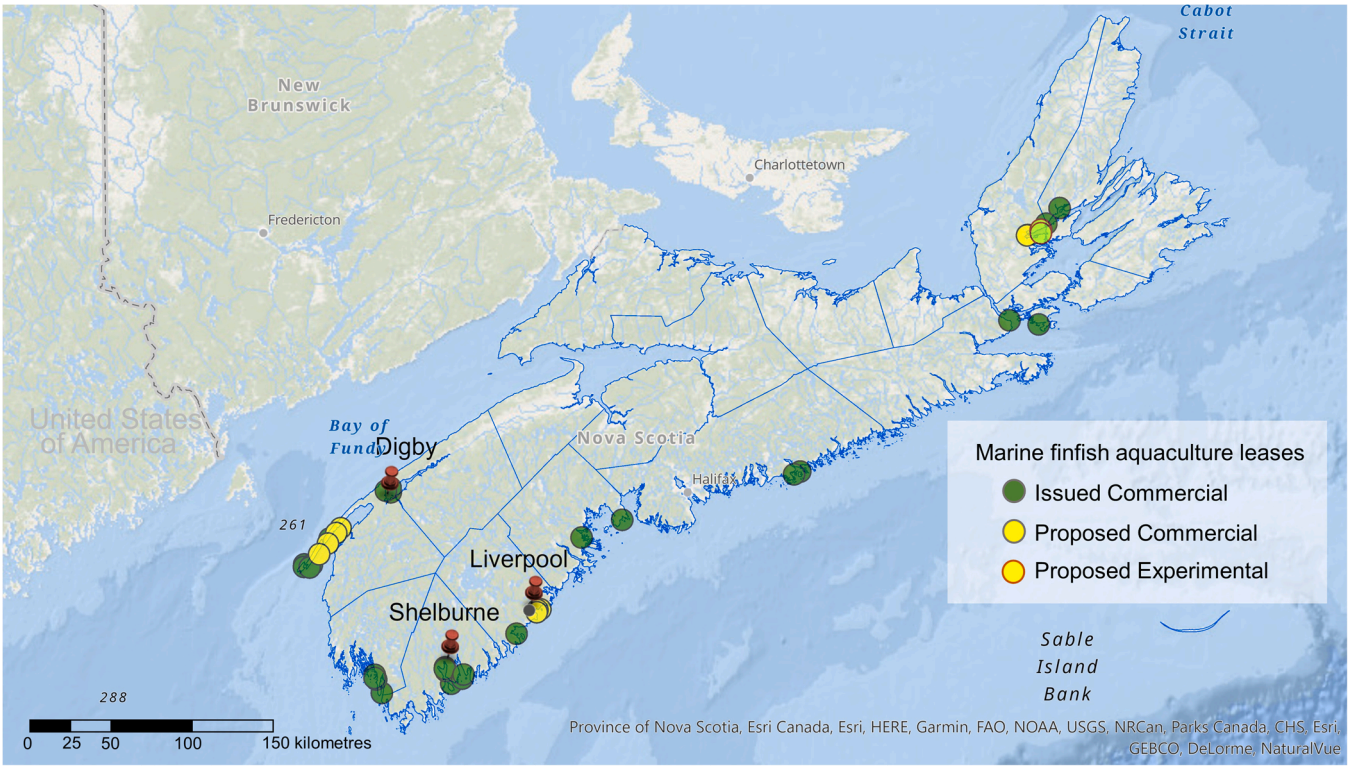

Fig. 1. Map of all marine finfish aquaculture lease locations in Nova Scotia in 2022 and salmon farming areas interviewed (pins).

Given previous research identifying environmental and place-based values as potential drivers of aquaculture acceptability (Ford et al., 2022; Weitzman et al., 2022), this study sought to elicit participant's values and prescribed importance to the coastal and ocean spaces and their priorities for development in their communities. Next, questions around participant's experiences and understanding of aquaculture were elicited to understand how individuals have been informed and engaged. Since trust is often considered fundamental in social license models (Moffat and Zhang, 2014; Thomson and Boutilier, 2011), questions elicited perceived trust for various actors in the industry, including government, aquaculture industry, and scientists. Finally, participants were asked to comment on various potential risks and benefits of aquaculture, informing their opinion of aquaculture and the legitimacy of aquaculture outputs. The second key area of questions focused more specifically on the general opinion of participants to aquaculture, asking participants to state their overall support or opposition and why. This included questions around their preferences and priorities for aquaculture development in their area, including their suggested improvements for the industry.

2.2. Data analysis

Once interviews were transcribed, a combined process of deductive and inductive coding was carried out using NVivo 12 PRO. First, open coding of transcripts divided sections of texts into codes representative of the full breadth of potential topics around aquaculture. Codes were conceptually categorized to identify topics and themes across the transcripts. Themes were inductively generated from interview data but also selected based on theoretical relevance from the literature. Axial coding was used to find relationships between categories and identify additional sub-categories. An iterative review of the transcripts across multiple rounds of coding refined the themes and topics in the final codebook (Appendix B). Consistent with a grounded theory approach, the final codebook was used as an interpretive framework for data analysis (Creswell and Creswell, 2018). The topics and themes were used to identify commonalities in perceptions and attitudes across participants to describe the main perspectives towards salmon farming. Comparison of the codes across interview groupings (categorizing social responses as either support or opposition) was used to identify insights and common factors influencing different social responses. The transcripts were re-examined across response groupings to investigate how the most prevalent themes manifested within each grouping of attitudes, which can help advance theory on what motivates attitudes and identify key perceptual factors. Unique attributes, while interesting, inhibits generalizability (Kennedy, 1979) so this study focused on the most common attributes shared among perspectives to help build theoretical premises which can be positioned to give rise to assertions about situations akin to the one studied.

3. Attitudes toward salmon farming

Based on the in-depth interviews, four different perspectives emerged reflecting different perceptions and attitudes about salmon farming (Table 1). Perspectives were classified based on shared preferences and similar discussions around key themes that emerged from the interviews. While this study details the four perspectives as distinct, they should be understood as a continuous spectrum of responses from opposition to support. No meaningful patterns between stakeholder groups emerged during the analysis. An analysis of the differences in perceptions between communities was beyond the scope of this paper but has been investigated as part of a larger research project by the authors (Weitzman, 2022). This section describes the experiences, arguments, and perceptions unique to each perspective, drawing on relevant participant quotations.

3.1. The "Not good anywhere" perspective

Several participants expressed negative attitudes about salmon aquaculture within broader arguments about natural resource management, sustainability, corporate motivations, and approaches to

Table 1
Summary of main perspectives about salmon farming and example quotations from interviews.

Perspective	Main viewpoint towards aquaculture	Response category	Preferences	Example quotes
Not good anywhere (n = 7)	Problematic nature of the industry, intertwined with criticisms beyond aquaculture that included government and corporate motivations	Oppose	Land-based	"I think that a lot of people perceive [salmon farming] as a series of environmental and community impacts that can't really be mitigated against or regulated against, simply by the nature of the technology and the nature of the industry."
Not good here (n = 5)	Not a good fit for the area, reflecting a clash of local desires and values against government and industry motivations and processes	Oppose	Land-based or improvements	"So why introduce it more to a small little province when it doesn't fit our image?"
Tolerable (n = 5)	Benefits need to be weighed against impacts, with improvements to resolve uncertainty about the industry	None (i.e., unaligned)	Improvements needed	"If there's going to be a future for aquaculture in the area, we need to start with the hard discussions… But I do believe that there is an opportunity for aquaculture in the area. I really do."
Moving forward (n = 7)	Opportunities support industry growth, if done sustainably and not at the expense of the environment and community	Support	Conditional increase	"Down the road, salmon farming in Nova Scotia. we have a unique opportunity."

governance, and defined the "nature of the industry" as inherently problematic. The participants claimed salmon farming to be unsustainable because of a cumulation of incidents around the world and scientific evidence of its adverse effects.

Perceptions of aquaculture risks were intertwined with wider concerns over the use and care for the environment. Some participants used concerns over the impacts of domesticated or genetically modified salmon escapes on wild populations to show how "man is always thinking they are smarter than nature". Disease and animal welfare concerns were deemed part and parcel of poor domestication processes and intensive farming seen among other animal-rearing industries like poultry and dairy. Others considered salmon farming as a manipulation of the natural processes: "I don't see these as salmon… The same way growing meat in a Petri dish, this is not natural". The participants described how this reflects a broader belief of issues within current political and economic systems that do not thinking holistically about the environment.

Criticisms of the motivations and mindsets of large corporations also characterized this perspective. Some participants felt the industry held a demeanor of contempt towards community concerns, driven by a lack of incentive to be forthcoming and truthful. Likewise, participants perceived the industry to harbour disdain towards regulations and environmental protection, leading to loss of perceived accountability of the industry. Some felt that the industry will act in a deceitful or secretive way to achieve its goals, driven by a principle of "maximizing profits at all costs".

These participants expressed strong criticisms of the influence of industry on governance, including opinions that government policies and procedures were biased to industry interests. Concerns over the dual mandate of the government to regulate and promote the industry were reflected in what one participant refers to as "hand in glove" action. The creation of bias was thought to be related to individuals in decision-making roles having industry backgrounds, a feature believed to be shared with other industries like forestry.

This perspective emphasized governance issues beyond aquaculture and criticized broader ways that governments use and manage natural resources. Some participants linked their attitude towards aquaculture with examples from other industries where government management has failed to predict and respond to nature in managing resources. In this way, concerns around salmon farming were seen as a product of a flawed policy system based on a growth mindset, which manifested in low confidence in government priorities for social or community well-being: "This government has to start planning without expansion in mind. That isn't the goal - the goal is happiness, quality of life and standard of living".

Many participants were pessimistic in their assessment of whether decision-makers could implement effective solutions to build a sustainable salmon farming industry. This perspective questioned the necessity of salmon as a food product, arguing that salmon farming was not part of the solution for either global or local food security, noting how salmon is an elite, expensive and luxury product not accessible to many Nova Scotians. Rather, all participants with this perspective believed salmon farming operations needed to be completely removed from the coastline, with land-based aquaculture the only way forward for the industry. For example, as one participant describes, "I think like at the expense of the environment, and I expect that at the expense of communities who live close by, it's just not worth it to do this kind of aquaculture anymore. There's so many other better options out there."

3.2. *The "Not good here" perspective*

Several participants emphasized concerns over the local impacts, believing that salmon farming was not a good "fit" for the area. These participants expressed concerns over where farmed were placed and believed current sites to be shallow and not receive adequate flushing, leading to concerns over animal welfare, marine habitat degradation, and consequences to wild populations. Several participants also expressed conflicts with other marine users, especially wild capture fisheries and tourism. These expressions suggested a perceived need to protect community livelihoods and well-being, much of which depends on maintaining the aesthetic and supportive values of the marine environment.

These concerns also included expressions that salmon farming does not fit into the broader culture of the place and does not represent what the community wants for the future. In this way, high levels of place attachment served to motivate opposition to aquaculture, as aquaculture was often seen to pose a threat to the community and place: "[For] Everyone that I know… income depends almost entirely on the fishery. So, it [impacts on fisheries from salmon farming] would entirely wipe out income completely. It's so close to home that it does get emotional". Concerns over foreign ownership emerged, juxtaposed with a community culture of supporting small local businesses, and more natural, self-sufficient lifestyles. In some ways, participants perceived local salmon companies to be "outsiders" with little willingness to meaningfully consider or contribute to the well-being of local communities. There also emerged a desire among participants to attract job opportunities and diversify employment locally, but salmon farming was not considered "part of that mix", especially given the belief that the industry only provided few poor-quality jobs. As one participant describes, "They [the industry] are great at wanting to employ people but not throw their money around the community".

Another central theme surrounded low confidence in how the provincial government makes decisions, engages the community, and enforces and monitors the industry. Many perceived government decisions to be motivated by economic growth rather than science and evidence. The participants reflected on experiences where they felt pushed aside when presenting the government with evidence that shows the negative impacts of salmon farms.

In addition, the participants perceived the government to have poor decision-making processes, leading to poor siting decisions and overall management. The participants had little confidence in the government's ability to enforce regulations, believing the government to not adequately punish the industry for regulatory violations. Insufficient communication and engagement processes were highlighted, with many participants perceiving the government to not be doing enough to meaningfully consider the community in decision-making. These participants advocated for community empowerment: "I think that the community… we have a voice, you know, it's, the government does have, shouldn't be allowed to make decisions for a community that clearly does not want open pen fish farms".

This perspective was also characterized by reference to experiences with local industry operations. These participants perceived the industry as not accountable, forthcoming, or a good community partner. The participants felt that the industry does not take accountability for the marine pollution and debris that wash up along the shoreline. Some participants referenced incidents where the industry has operated beyond lease boundaries, reflecting a perception of the industry going about its business with a brazen attitude.

Consequently, many participants were pessimistic about the future of the sector, but recommended a shift to land-based, seeing it as an opportunity to create win-win scenarios for the local environment and community. As one participant described, "Get it away from the coast cause it's just ruining our coasts". However, others suggested improvements, including open and transparent communication and rigorous environmental assessments.

3.3. The "Tolerable" perspective

A third perspective emerged among respondents who manifested a complex discourse about weighing benefits and risks, presenting a neutral position on aquaculture. Benefits recognized by participants revolved mainly around future local and global needs. Globally, participants advocated food security benefits, especially given a growing population. Locally, participants acknowledged the potential of aquaculture for employment and economic benefits to communities.

Yet, this group also expressed negative perceptions of the socio-economic benefits aquaculture affords to communities. They highlighted concerns about the overexploitation of the local area that can sometimes happen with foreign industries: "So it isn't, I don't even know if I have a negative attitude towards fish farming. I think I just have a negative attitude toward the 'Grab and go' thing that sometimes happens".

The participants reflected on experiences of broken promises and unmet expectations by local salmon farming companies as reducing participant's confidence in the industry and the government's commitment to the communities. For some, this manifested as low institutional trust in government based on experiences with other industries, such as fisheries. In relation to aquaculture, some perceived a lack of company accountability, exemplified by beliefs that companies do not do enough to remove litter that washes ashore from farms. As a result, the participants emphasized the need for industry to become better community partners and work with communities to create win-win scenarios:

> "I would hope that whoever the company is coming in they would work with the community… If you can work together, then it's something that would be beneficial on both sides… But they [the community] have to see it's a positive growth between the two."

Central to this perspective was a sense of uncertainty around the industry and its governance. Many participants identified a range of potential environmental impacts of salmon farming, but many admitted they knew little about it, drawing from examples in other areas and the media, but recognized they had little direct interactions with the industry. Some participants recognized that few direct experiences with the industry can lead to uncertainties and fear around the impacts of the industry. Thus, the participants believed improvements in education and communication were necessary for the industry:

> "I think that if they [the industry] maybe explain their objectives and what they are doing with this fish and their plans are for the future. Maybe if they explained things a little bit better to everybody, people might settle in with a little bit more."

In particular, several participants wanted more information about environmental risks, how governments make siting and policy decisions, and about economic benefits to communities.

3.4. The "Moving forward" perspective

Supporters of salmon farming embodied a perspective focused on both local socio-economic benefits and global food security opportunities from salmon farming. The participants expressed excitement over the potential benefits of expansion, and the possibility to create jobs and support economic spinoffs in the area, where there is a need for economic development. Globally, salmon aquaculture was seen to support protein needs now and in the future:

> "Whether it's now, or 200 years from now, the need for good protein from the ocean is only going to grow. The only way we are going to satisfy those numbers is by applying agriculture techniques to ocean development. It has to happen".

The perceptions reflected a sense that aquaculture was needed if people want to continue eating fish.

These participants recognized that industry changes over the years have led to significant positive improvements for the industry. The participants recognized the industry's "growing pains" at the infancy of the industry in Nova Scotia. For these participants, the industry has worked hard to improve communication, conduct research, and change practices and technologies in response to issues and community concerns. For some participants, the perceived evolution of the industry and accountability has helped build their trust in industry: "They [the industry] have certainly made some mistakes… But I think with them being punished, they have rebuilt trust with me". In addition, some participants recognized that governments have made substantial regulatory improvements, although they highlighted the need to continue improving regulations, especially by simplifying and standardizing them. In addition, participants also identified that it was critical that industries work with fisheries interests and that siting decisions do not interfere with traditional fishing grounds.

The participants often linked positive attitudes to good personal interactions with the industry. The industry was portrayed as genuine and forthcoming with information, with participants describing the industry as open to questions, and wanting to be part of the community:

> "I think they do listen, at least in my experiences. [the company] is a great advocate for caring for [its] workers, for caring what the community think and want. And they want to be part of the community."

This perspective considered aquaculture a sustainable industry and argued that there is little evidence to support major environmental risks for aquaculture locally. For these participants, current sites were considered adequately located to support salmon growth without environmental harm. In addition, the participants felt the industry was operating farms well, reflected in their confidence in current regulations: "There are small issues but no real negative impacts. Because if you do everything right in terms of husbandry, stocking density, etc. you don't have negative impacts".

These participants addressed criticisms of the potential impacts on wild fisheries, drawing from statistics on the continued profitability and population status of wild stocks. Drawing from experiences, these participants argued that not all fishers are affected by, or oppose aquaculture, and others in fact benefit from increased lobster catches near cages.

As one participant describes:

> "We do have fishermen in our area that have no problem with aquaculture. But if you say to them, we are going to take over all your fishing spots, there would be a problem. They want to live in harmony and that's all they ask for."

Rather, this perspective believed much of the criticism towards aquaculture is based on misinformation and other factors such as attitudes towards any change in people's community or environment, with some highlighting that "education is key" and the need for communication. Supporters also emphasized the continued importance of managing environmental risks in their opinions to aquaculture: "If salmon farming did everything they were regulated to do and it was still going to cause harm to the environment, I would say, no it's not going to work." Therefore, the participants highlighted the sector should continue increasing oversight, reducing risks, and conducting scientific research.

4. Identifying factors driving social response

4.1. Perceptual factors around legitimacy

Thematic coding of interviews manifested several common themes shared across perspectives, with participant attitudes expressing different judgements towards three main dimensions of legitimacy, including input legitimacy, throughput legitimacy, and output legitimacy (Table 2). The findings from this study illustrates conflicting perceptions of legitimacy across perspectives (Appendix C), reinforcing the utility of legitimacy as a frame to operationalize social acceptance (Washington and Zajac, 2005; Zimmerman and Zeitz, 2002). The factors drawn on below were chosen as representative and illustrate saturated themes from interview transcripts.

4.1.1. Input legitimacy – policies and procedures

Participants commonly focused their arguments about aquaculture on several themes regarding the legitimacy of policies and procedures and manifested questions around how decisions are made (Table 2). Increasingly, aspects of governance have become more prominent in public conflicts of aquaculture (Condie et al., 2022; Ertör and Ortega-Cerdà, 2015; Salgado et al., 2015). In addition, these findings are consistent with emerging discourses of mistrust towards regulative agencies and the need to reform many policy processes (Billi et al., 2022).

One topic of contention revolved around how governments use evidence in their decisions. While the participants agreed that scientific research and evidence-based decision-making were paramount, differing views emerged on how effectively science was being applied, reflecting polarized views among participants (e.g., Condie et al., 2022). In this study, opponents perceived governments to be ignorant of scientific findings that may denounce the industry, reflecting concerns of a broader regulatory environment in Canada that has not responded

Table 2
Main emergent themes deduced inductively from interview coding, categorized within three main dimensions of governance legitimacy.

Dimensions of legitimacy	Themes generated from interviews	Example quotes	
		Supporters	Opponents
Input legitimacy: *based on perceptions related to the procedures, processes, and policies that feed into decision-making processes*	Evidence behind decisions	"We know the science on salmon farming, this has been done across the world for 40–50 years…"	"I've been up there with the suits, they think they are the experts, but WE are experts, we're the ones living next to it for 20 years."
	Priorities and motivations	"What I'm seeing…is that [the industry's] really trying…They're trying to make it better, to use the best practices, to cut their costs their way, and to not affect the environment."	"They go ahead and do whatever they want…It's a private company… They will do what they wanted to fit their business model…"
	Industry oversight	"But if they follow the rules and do what they're supposed to do, I can't see where its impacting anything."	"Then there's very little enforcement of regulations. That's my main problem."
	Who makes decisions	"Even though they've been here for 25 years, I still think they are finding themselves. And everybody really needs to just sit in a room and say this is how its going to go."	"…it's a flawed system. It's not supervised… and it seems to be driven by the stakeholders rather than the people that matter."
	Transparency and availability of information	"If I've got to sum it up in one word – communication. I think the information is all there… just get the right people together and communicate to them."	"So they hide the renewal down a deep rabbit hole on the website of [the government]. Like it's not, it's not bright and top and center…"
Throughput legitimacy: *the ways that people are involved in the policy process, involving knowledge and engagement*	Reliability of information	"They [the government] let the media outline it. And media… they usually don't agree. They slant it…"	"I think the government needs to rely on research and information that is not provided by the industry. It's sort of cherry picking."
	Community and stakeholder engagement	"We, as the stakeholders have the opportunity to voice our concerns. I think they listen more than people realize."	"Um, so it's, as far as I'm concerned, the industry seems to take a 'pound sand' attitude about community engagement."
	Environmental impacts	"I don't see a huge impact coming from aquaculture sites that are properly located in areas where they flush well"	"It's not a matter of if it's just when the bottom will become polluted…it's a real mess."
Output legitimacy: *relates to the outcomes of policies and procedures (e.g., the social and environmental impacts of aquaculture)*	Material well-being (economic and health impacts)	"It would certainly be wonderful to get one of these companies in and build a 2–3 billion dollar for GDP."	"They've shown that the number of jobs is roughly the same as it was 15 years ago. And yet the production of fish has gone up…So there are no jobs, it's a joke. And what jobs are, are menial jobs."
	Subjective well-being (experience, aspirations, spiritual)	"They have done a little community support stuff, I am not sure how much. They are getting to be a better community partner."	"…when it started to smell, the kids couldn't go on the beach anymore…"
	Relational well-being (concerning personal and social relations)	"I think some of the locals are quite vocal, but then they're quite the same people who are quite vocal about everything."	"The most negative impact…was the way that [the industry] went about dividing the community."
	Distribution or risks and benefits	"So the increased business opportunities…would help encourage sustainable development.If they can support the local economy, everybody's on the same page."	"They [industry] are great at wanting to employ people but not throw their money around the community."

effectively to results of scientific analysis (Soomai, 2017). A perceived tendency of governments to ignore science in decision-making was often linked to eroded trust in government and industry science, leading to arguments that decisions should be based on rigorous, independent scientific evidence. In comparison, positive attitudes manifested as confidence in the scientific evidence used in decision-making, with supporters believing that decisions undergo multiple rounds of consultation so that evidence is "under the radar" multiple times. In addition, this study found competing values over including experiential knowledge of local experts in decision-making. These arguments reflect differing epistemologies of science for aquaculture planning, which has been linked to conflicts in perceptions in aquaculture in New Zealand (McGinnis and Collins, 2013).

One major theme put forward by opponents reflected the priorities and motivations behind policy decisions, which were perceived to ignore broader environmental impacts and social well-being. This study reinforces findings in other salmon farming areas (e.g., Ford et al., 2022; Lindland et al., 2019), where communities have criticized economic motivations and growth priorities of government and industry. In addition, these criticisms were linked to a sense of distrust, as participants felt government and industry did not respect the community interests or values, suggesting a legitimacy-gap based on perceived disagreements regarding what is valued (Boltanski and Thévenot, 2006).

Perceptions of industry oversight emerged in relation to how governments oversee the aquaculture industry to protect the environment and public interest. In the present work, disagreements emerged over the ability of governments to meet regulatory expectations through monitoring and enforcement, which the participants considered critical for ensuring sustainability. These findings further support ongoing public criticisms, which are demanding stronger and more stringent regulatory oversight (see Mather and Fanning, 2019). In addition, conflicts over the content of regulations emerged, with opponents perceiving regulations as not the claimed "gold standard", criticizing perceived deficits in the government's process for Environmental Impact Assessments (EIA), as well as a lack of transparency and inadequate communications. These findings are consistent with research from Norway, where poor content legitimacy of regulations and policies has related to low acceptance of aquaculture (Bjørkan and Eilertsen, 2020; Sønvisen and Vik, 2021). Conversely, supporters recognized regulatory changes in the province (e.g., Withers, October, 2015), leading to the perception of substantive improvements and positive attitudes towards aquaculture regulation.

Social responses were also driven by arguments around who makes decisions, reflecting perceptions of procedural fairness and participatory governance. Perceptions of bias and misrepresentation manifested concerns over distribution of power into the hand of industry, with opponents feeling decisions are driven by industry desires more than desire of communities. These concerns were also linked to criticisms regarding the dual role of government acting as both regulator and promoter of the industry, a longstanding source of conflict across Atlantic Canada (e.g., Doelle and Lahey, 2014; Maxwell and Filgueira, 2020; Rigby et al., 2017). Others highlighted structural issues with having government positions held by previous industry members. These concerns manifested a sense of "bias" and poor legitimacy of policy processes, since neutrality of decision-makers is as a key component of procedural legitimacy (Tyler, 2007). In addition, opponents linked their feelings of distrust, of being ignored, and unfairness of government and industry to a perceived exclusion of citizens and relevant stakeholder groups during aquaculture decision-making. Complaints about fair and participatory governance for aquaculture have likewise motivated opposition movements in Europe (Ertör and Ortega-Cerdà, 2015). Furthermore, opponent perspectives encapsulated issues beyond aquaculture but related to decentralized community planning, reflecting a desire for communities to have greater power in determining what types of industries are best for an area. These issues are consistent with growing resistance against top-down management for more integrated, holistic marine planning in coastal Nova Scotian communities (Wilson and Wiber, 2009). Yet, supporters refuted the shift towards more bottom-up management approaches, stating this approach is driven by people who have little understanding and awareness of aquaculture issues. As one participant describes, "The problem is, the smaller level of government you go, politics become small… You got people who are not well informed, and you put them in authority, and they become 'leading scientific advocates' with their opinions they download off the internet…".

4.1.2. *Throughput legitimacy—engagement and information*

The findings from this research suggest that social responses to aquaculture are driven both by how people access and trust information about aquaculture, and how individuals are engaged during decision-making (Table 2). Likewise, social acceptance research has identified links between attitudes developed through experiences and knowledge (e.g., Stankey and Shindler, 2006), reflecting ideas about the legitimacy of governance throughputs, or how people perceive the way they are engaged (Schmidt, 2013). The findings in this study also corroborate discussions of the importance of transparency, inclusiveness, accountability, and openness in mediating the legitimacy of governance throughputs (Taylor, 2019).

This work reinforces the critical role that transparency of information plays in the social acceptance of aquaculture (Trueman et al., 2022), leading to more accountable and legitimate governance (Schmidt, 2013). Opponents highlighted the lack of access to reliable, independent information about aquaculture, reflecting resistance movements in other salmon farming areas (e.g., Baines and Edwards, 2018; Ertör and Ortega-Cerdà, 2015). Conversely, supporters perceived information to be available, though often provided through personal experiences and dialogue; these participants thus raised issues of making the public aware of information, emphasizing the importance of education and awareness-raising. For example, supporters often emphasized the need for increased clarity in the government processes:

> "I think they should let the public know that they've done these inspections on a regular basis. That would be helpful because I think the public just want to be reassured that they are following the guidelines and the rules, and I think it's due diligence on their part."

In addition, the participants stressed that their perceptions around transparency were also influenced by the way governments and industry communicate information, highlighting the importance of improving clarity and minimizing confusion in the effectiveness of transparency (Fox, 2007).

These findings illustrate that social responses to aquaculture were intertwined with perceptions of the reliability of information about aquaculture. The relevance of this theme reinforces the link between legitimacy of information and knowledge and social acceptance (Cullen-Knox et al., 2017), where the "effectiveness" of evidence-based decision-making relies on perceptions of credibility, relevance, and legitimacy of scientific knowledge (Cash et al., 2003). For example, the opponents expressed little trust in the information made available by the government and industry, which was often perceived as "propaganda" for the industry. In addition, different perceptions on the legitimacy and trust towards information sources suggest that for some individuals, awareness-raising and transparency alone will not necessarily generate positive attitudes: "Everything is transparent, but I don't trust that they [the aquaculture industry and government] will actually do what they say". Yet, all perspectives presented rational arguments based on "objective and factual knowledge", emphasizing how conflicting paradigms of knowledge can influence social responses (Aasetre & Vik, 2013). Yet, scientific knowledge can become politicized, as interest groups can "cherry-pick" information and mobilize scientific findings to support conflicting positions on aquaculture (Sønvisen and Vik, 2021). This process of "cherry-picking" may contribute to misinformation, which was quoted by both supporters and opponents as a challenge for

the industry. In addition, several participants criticized the role of media, both news media and social media, which is reportedly spreading misinformation about the industry and its benefits and risks. Yet, many participants referred to media as sources of information, suggesting a complex role of media in social conflicts, which has been previously recognized in aquaculture debates in Atlantic Canada (Maxwell and Filgueira, 2020; Trueman et al., 2022).

Negative perceptions were not always embedded in deficits in public understanding or lack of knowledge, but in affective responses to how individuals are communicated with and engaged. Some participants expressed how communication alone is meaningless if the government and industry are not open and inclusive, giving locals the opportunity to speak and be heard. Likewise, social acceptance literature across other resource sectors considers procedural fairness, that is processes that allow citizens to express their views, to be intertwined with trust and acceptability of processes (e.g., Huijts et al., 2012; Mercer-Mapstone et al., 2018). In addition, how industry and government respond to public concerns was a common theme raised by opponents, who described feeling "handled" or "manipulated" by government and industry, and frustrations over concerns "laying on deaf ears", built from their experiences of in-action following public criticism. Conflicts also involved fairness in the ability of different interest groups, including citizens and key stakeholders (like fishers) during engagement processes. For example, some opponents framed engagement processes as non-inclusive: "There were meetings held that were not either publicized or open to the public but rather were held with a select group of what [the industry] considered to be stakeholders…".

Responses were also driven by conflicting views on the quality of interpersonal relationships between aquaculture (industry and government) and community during engagement. Many opponents perceived industry and government to be contemptuous and disingenuous, contrasting with positive interactions expressed by supporters, who perceived the industry and government to be genuine, open, and forthcoming. These findings echo conflicting views on engagement in aquaculture in other areas (e.g., Billing, 2018; Sinner et al., 2020), reinforcing the need for positive, respectful relationships between community and industry actors. Reflecting findings from other sectors (e.g., mining; Mercer-Mapstone et al., 2018; Moffat and Zhang, 2014), these results suggest that both the extent and quality of contact are key predictors of social responses, emphasizing the importance of the nature of relationships on building trust and driving social acceptance for aquaculture (Baines and Edwards, 2018).

4.1.3. Output legitimacy–perception of impacts and outcomes

The perceptions reflected various themes related to output legitimacy as reflecting a complex process of weighing perception of risks and benefits, in addition to judgements on whether they are deemed appropriate based on what societies want and value (Table 2). These finding reinforce perception of risks and benefits as an important driver of social response, supporting other social acceptance studies in aquaculture (e.g., Bailey and Eggereide, 2020; Freeman et al., 2012; Mazur and Curtis, 2006; Whitmarsh and Palmieri, 2009).

Perceptions and participant evaluations of environmental risks of salmon farming was a recurring theme shaping diverging attitudes to aquaculture. The emphasis of potential environmental impacts such as impacts on wild marine species and habitats from disease, escapes, and fish waste reflect well-known conflicts around salmon aquaculture around the world (Cullen-Knox et al., 2019; Olsen and Osmundsen, 2017; Rickard et al., 2018; Krøvel et al., 2019). Often, these perceptions were based on diverging understanding of scientific evidence and conflicting messages on the interactions of aquaculture in the marine environment. For example, in emphasizing the perceived risks from disease spread, opponents highlighted "[the industry] can put a spin on it and say, 'we have all the ways to stop that from happening', well that's not true." Supporters often refuted the severity of perceived impacts and highlighted the existence of misinformation in their arguments. For example, in response to the perception of impacts from sea lice, one participant describes: "They [in reference to opponents] make it sound like salmon [farming] is the cause of sea lice… [salmon farming] do[es] perpetuate it some, but it is natural to the ocean". Nevertheless, the recognition of environmental risks and the complex role of scientific evidence in decision-making across all participants reflected a prevalent priority placed on environmental impact assessments to mitigate potential risks, underscoring the importance of planning for, and minimizing risks to, the marine environment in improving the perceived legitimacy of aquaculture.

Moreover, social responses to aquaculture exhibited complex arguments over the consequences of environmental and social impacts on individual and community material, subjective, and relational well-being. These findings underscore the importance of ongoing work investigating how to incorporate well-being into aquaculture decision-making (Alexander, 2022; Krause et al., 2015), advocating a focus away from governance mechanisms that prioritize economic growth through the "Blue Economy" to more holistic priorities of well-being encapsulated by the "Blue Communities" approach (Campbell et al., 2021).

Perceptions of aquaculture's influence on material well-being encompassed conflicting arguments around economic benefits, including direct employment and potential economic spinoffs, emphasizing social responses as intertwined with whether aquaculture acts as a potential provider to communities and reinforcing the importance of socio-economic impacts in perceived legitimacy of aquaculture (Bjørkan and Eilertsen, 2020). In addition, conflicting ideals about aquaculture's potential impact on other livelihoods, including concerns over fisheries displacement, marine access, and visual impacts, reflected similar concerns over aquaculture expansion at the expense of other social and economic activities in other areas (e.g., Ertör and Ortega-Cerdà, 2015). An important part of material well-being also manifested as conflicts around the role of aquaculture as a food system, echoing broader contention over the health benefits of salmon (Amberg and Hall, 2008), and how aquaculture can address food security amidst increasing global demands for seafood (Belton et al., 2020).

In addition, the participants also expressed concerns regarding the impacts on subjective (that is spiritual, emotional, or mental) well-being. For example, aesthetic concerns were often linked to people's non-instrumental uses of the environment for recreation or enjoyment, encompassing aspects such as sense of place, spiritual, and cultural heritage (e.g., Cooper et al., 2016). For example, one participant describes "[This area], it's a fantastic place. It's a beautiful place. And then you've got these fish farms, slap bang in the middle of it. And you think that's kind of destroyed the 'feel of the place'." Subsequently, a prominent criticism of opponents revolved around their perception of the industry as not being a legitimate user of the environment, since the industry was perceived to interfere with how they experience and value the environment. These concerns support ongoing discussions within broader social acceptance literature placing values as a central motivating factor in people's attitudes towards environmental governance outcomes (Stankey and Shindler, 2006). In addition, perception of benefits was influenced by how participants felt they contributed to individual and community aspirations for the area, a feature previously found in other salmon farming areas (e.g., Alexander, 2022).

A recurring theme also emerged over aquaculture's impacts on relational well-being, as conflicts around aquaculture impact relationships between individuals. For example, several participants believed aquaculture to create community impacts by generating social tensions and "community splits", which can contribute to what Vanclay (2002) calls a process of "othering", a form of cultural differentiation, that is, the increased differences between various groups in a community. As some participants described, these conflicts have impacted relationships within the community, thus community cohesion and overall sense of social well-being. For example, participants describe the adversarial nature of the topic within communities: "I noticed that there was a real

shift, an 'us versus them'… and so there's a lot of contention. And I think at a small community, it has a real effect because now you're fighting with your neighbors."

Another relevant feature related to perceived output legitimacy of salmon aquaculture emerged out of conflicts underlying the desire for fair distribution of risks and benefits. For example, while many participants recognized positive economic impacts of aquaculture, the fairness in the distribution of economic benefits was a more relevant driver for acceptance, and a major criticism raised by opponents. As one participant questions, "So where are the benefits going? It's certainly not going to the province and the local people." Likewise, another participant emphasizes a perceived 'façade' of economic benefits: "This idea that there is economic benefit, there is zilch…They [the industry] do not spend a nickel in your community."

Distribution of benefits has likewise been recognized as an important facet of conflicts in other salmon farming areas (e.g., Ertör and Ortega-Cerdà, 2015; Sinner et al., 2020), which similarly recognizes that focusing on purely material benefits such as contribution to Gross Domestic Product (GDP) is unlikely to build public confidence in aquaculture. In addition, opponents criticized government subsidies and incentives, feeling that government and taxpayers are paying for the industry and their mistakes, while also receiving very little tax revenues from fish farms, leading to unjust distribution of benefits (e.g., Ertör and Ortega-Cerdà, 2015). These findings reinforce conclusions from wind energy developments (Gross, 2007) that found that unjust distribution of benefits can create a perception of financial "winners and losers" and damage the social well-being of communities. As a result, this study supports findings from other sectors emphasizing that factors related to distributional justice and distributive fairness are a key component of the social acceptance of aquaculture (Huijts et al., 2012; Wüstenhagen et al., 2007; Zhang et al., 2015).

4.2. Perceived trust

Perceptions of trust emerged as the primary driver and determinant of differences in attitudes, suggesting trust as a key perceptual factor of social response (Appendix C). Opponents expressed strong, sometimes emotional arguments for mistrust in both government and industry: "I have found [the industry] to be dishonest, duplicitous, treacherous, untrustworthy. I've got virtually nothing good to say about them." Participants with a tolerable perspective emphasized the need to build trust and perceived opportunities to do so: "You know, you have to earn trust. And I don't think either the government or the fish farms have earned that trust, yet." Comparatively, all supporters expressed at least a moderate amount of trust and confidence in government and industry. These findings indicate that trust may not be necessary for community acceptance and tolerance of the industry in an area, but a pre-condition for support and approval of aquaculture. Likewise, trust has been regarded as a primary motivator for social acceptance in aquaculture (Alexander, 2022; Freeman et al., 2012; Mazur and Curtis, 2008; Tiller et al., 2017) and other resource sectors (e.g., Ford and Williams, 2016; Huijts et al., 2012; Ross et al., 2014). This study considers trust as a cross-cutting issue, as community perceptions of trust were influenced by other elements (like the assessment of risks, fairness, and awareness), and likewise also influenced them. Pre-existing, and sometimes prejudiced, opinions about individuals and institutions (Evans and Revelle, 2008) can also influence perceptions of trust. For example, a history of conflicts in other industries can erode institutional trust in government (Salgado et al., 2015), while beliefs about corporations can influence the trustworthiness of large aquaculture companies (Ford et al., 2022). Moreover, perceptions of throughput legitimacy based on how individuals are engaged influenced trust between individual persons, which emerged as an important motivator in people's response to aquaculture. For example, as one opponent describes "That's why I say you can't trust them – You can't trust anything they say, and if you ask them a question, all they do is lie. That seriously erodes the relationship between communities and industry". These perceptions support the important role of relationship building for effective decision-making highlighted in previous SA work (Parkins and Mitchell, 2005; Moffat and Zhang, 2014). Perceptions of trust can also shape and motivate other perceptual factors. For example, findings from this study reinforce the link between trust and evaluations of risks and benefits identified across SA research in other sectors (e.g., Huijts et al., 2012). In this study, trust in scientific information and actors communicating scientific information was often mobilized in respondent's evaluations of aquaculture risks and benefits, highlighting the dynamic interplays between output legitimacy and trust. Taken together, the findings from this study illustrate a key role for trust in mediating attitudes towards salmon farming, reinforcing the critical need for governments and industry to build and maintain trust for more legitimate aquaculture decision-making.

This study identified several themes relating to the trustworthiness of the procedures underlying aquaculture governance, suggesting that institutional trust was a key factor in driving social responses to aquaculture. This study thus supports previous arguments that institutional trust may be more important than interpersonal trust between individuals in legitimate planning and decision-making (Parkins and Mitchell, 2005). Opponents expressed strong distrust in government decisions. Their arguments remarked on both perceived failures to enforce the regulations that govern the industry and in themes related to challenges with governance structures, often extending to other resource sectors as well. Yet, supporters had high perceived confidence in government, citing regulatory changes as a major driver of built confidence. These findings highlight how perceptions of procedural legitimacy is a relevant determinant of trust, ultimately guiding people's responses to aquaculture. While industry trustworthiness was also a point of contention between opponents and supporters, perceived trust was similar for both industry and government, highlighting the interconnectedness of actors within the sector. Several other participants emphasized that their perceptions of industry and government were "painted with the same brush", highlighting how aquaculture can represent a single systemic 'entity'. The trustworthiness of other actors may also apply to understanding social acceptance (e.g., Alexander, 2022), as the participants in this study criticized the role of media and NGOs in shaping the information that people receive. In conclusion, findings from this study emphasize the importance of both institutional and interpersonal trust in social acceptance of salmon aquaculture.

5. Conclusions: understanding social acceptance in aquaculture

The in-depth interviews with residents and stakeholders in three salmon farming communities revealed a diversity of perceptions about the management and potential impacts of salmon aquaculture, manifesting as four diverging perspectives towards aquaculture. Likewise, recent research has identified a range of differing views and conflicts within communities amidst the expansion of salmon aquaculture (Froehlich et al., 2017; Lindland et al., 2019; Young et al., 2019), reinforcing ongoing debates on the controversial nature of salmon aquaculture (e.g., Condie et al., 2022; Young and Matthews, 2010). Conflicts, concerns, and priorities were not homogeneous, even among those with similar overall opinions, suggesting that decision-makers should acknowledge a continuous spectrum of perspectives towards aquaculture. This study recognizes that the controversy over aquaculture symbolizes more than just attitudes about salmon farms; rather, the findings in this study support previous research that demonstrates the aquaculture controversy incorporates a suite of wider public issues, such as animal rights, food safety and security, corporate power, and community empowerment (Ladd, 2011). Further, social responses expressed nuanced considerations of how aquaculture supports individual and social well-being, reflecting not only the physical manifestations of impacts (in terms of relocation, employment etc.) but also the meanings, perceptions, and social significance of changes. Accordingly, policies

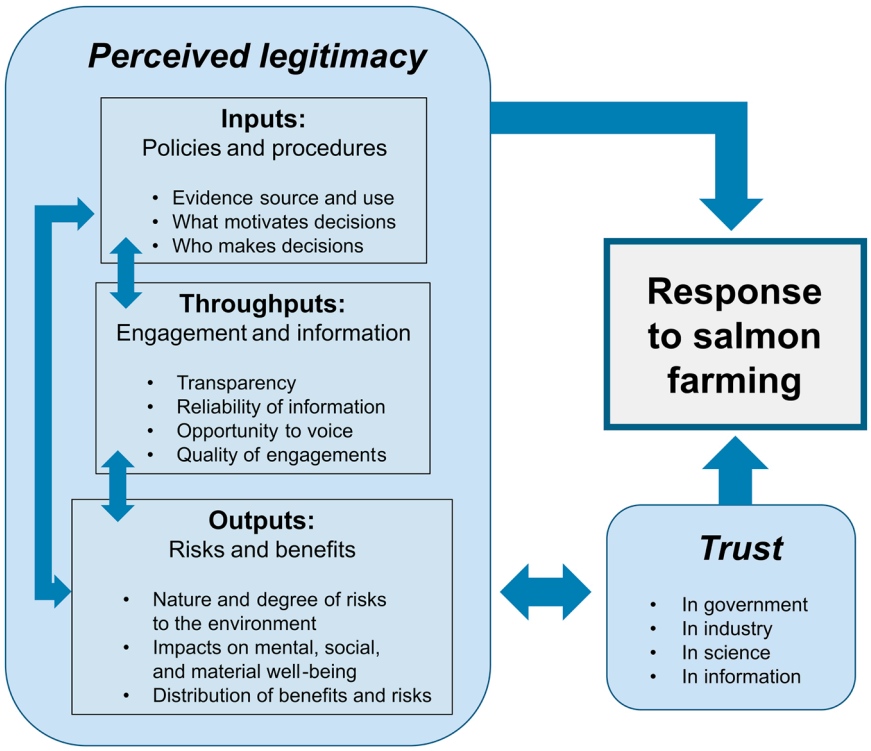

Fig. 2. Conceptual model of perceptual factors and how they interact to influencing social response to salmon farming.

that consider different understandings of value and well-being domains may contribute to more legitimate planning for aquaculture.

The grounded qualitative approach used in this study has allowed for an in-depth analysis of community perceptions and has helped unravel some of the complexities in the factors that influence SA for salmon aquaculture. This study has highlighted trust and legitimacy as the most relevant attributes explaining differing attitudes shared among perspectives (Fig. 2). While the qualitative nature of this work means that it should not be generalized to other areas, the findings from this study reinforce what has been found in the wider literature, and reflects similarities to other models of SA, whereby social response is mediated by a combination of cognitive and affective beliefs about aquaculture, mediated by values and contextual factors (Ford et al., 2022; Stankey and Shindler, 2006). By identifying a diversity of perceptual factors that shape attitudes toward aquaculture, this work can inform further development of conceptual models for social acceptance and understand the key drivers of social responses for aquaculture. Framing of perceptions around legitimacy proved useful to organize emergent themes related to participant's perceptions of how decisions are made, how stakeholders are engaged and informed, and how benefits and costs from aquaculture are distributed. This conceptual model also recognizes feedback across components of legitimacy, contending that each component of legitimacy, on their own, are insufficient to evaluate social responses to aquaculture. Likewise, legitimacy is deeply intertwined with evaluations of trust in government, industry, and science, which is a key predictor of social responses. Therefore, perceptions of aquaculture legitimacy present a comprehensive and useful lens for investigating both drivers of opinion and drawing practical links to industry and government policies and decision-making processes. While mobilizing the concept of legitimacy into measures of social acceptance warrants further empirical research, indicators of legitimacy may prove more meaningful than simple measures of opinion, such as determining opinion towards risks or benefits. While this model only considers perceptual factors, other factors may affect social response to salmon farming, such as individual traits (e.g., socio-demographic variables) and contextual factors. Nevertheless, this conceptual model can help clarify the relative importance and interactions between perceptual drivers of social acceptance in aquaculture and help inform the design of more sustainable and legitimate aquaculture governance.

CRediT authorship contribution statement

Jenny Weitzman: Conceptualization, Methodology, Investigation, Formal analysis, Funding acquisition, Writing. **Ramon Filgueira:** Supervision, Writing – review & editing. **Jon Grant:** Supervision, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability

The data that has been used is confidential.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.envsci.2023.02.019.

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