



## Fisheries governance and associated health implications: Current perspectives from US commercial fishermen

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### ABSTRACT

Developing useful regulations that lead to intended effects from originating legislation can be a challenge for those entities that are implementing and responding to those regulations. In the commercial fishing industry, fisheries management regulations are fundamentally designed to conserve and sustain marine resources. Numerous studies have underscored the importance of engaging commercial fishermen in discussions of how to best preserve these resources. By ensuring numerous, diverse perspectives, policies and associated implementing regulations can thus address a broad spectrum of concerns and utilize input from a wide spectrum of knowledgeable informants to make regulations more effective and easier to enforce. The purpose of this manuscript is to share our findings on fishermen's perceptions of the fisheries governance process and to describe how these perceptions impact their emotional health and willingness to engage in future fisheries management discussions. In sharing these perspectives, we hope to underscore the need for further research on fishermen's governance experiences and to highlight how prior negative experiences could adversely impact future engagement with the process. The data highlighted in this study was gathered from interviews originally conducted to explore fishermen's sleep patterns and general health in the Alaska salmon, Oregon Dungeness crab, Northeast scallop and Massachusetts lobster fisheries. However, a primary theme that emerged from these interviews was the impact that fisheries management decisions had on work-related stress. Stressors were largely related to increasing regulatory complexity and the economic impact of management decisions that add to an already challenging commercial enterprise. The governance process was also seen as yet another factor outside of fishermen's direct control, which when combined with unpredictable weather, access to reliable crew and rapid shifts in market prices, has severe consequences to their overall sense of wellbeing. While increased engagement has been highlighted in the literature as a means for addressing fishermen's regulatory concerns, our informants believe their input is neither valued nor prioritized, which appears to threaten future engagement in fisheries management discussions.

### 1. Introduction

In a 2016 report published by the Food and Agricultural Organization of the United Nations (FAO), the authors examine a number of pathways for management regulations to impact worker safety on fishing vessels [1]. The report presents several hypotheses regarding either the negative or positive impacts of fisheries management decisions on safety, along with case studies that present a spectrum of evidence supporting these hypotheses. One of the hypotheses discussed in the

report is the potential for management regulations to have wide-ranging, indirect impacts on fishing health and safety. A number of examples include restricting fishermen's options for where they fish, when they fish, the vessels they use and crew size. One of the primary conclusions from the FAO report is that representatives from fisheries management, safety professionals and fishermen need to discuss and be aware of the impact of management decisions on fisheries safety. While attention to the impact of fisheries management decisions on physical safety is laudable, there is little discussion regarding how the

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governance process impacts fishermen's emotional health or their ongoing willingness to engage in the negotiation process. It is also important to note the Magnuson-Stevens Conservation and Management Act (Magnuson-Stevens Act) includes National Standard 10 which requires consideration of safety impacts in U.S. fisheries management actions [2].

In the literature relative to fisheries management, it is widely assumed that more engagement in the governance process is a good thing [3,4]. Governance is broadly defined by Rosenau [5] as the mechanisms, individuals and organizations that collectively discuss and mediate their interests and obligations to make decisions affecting society. Governance is a challenging endeavor especially when, it comes to the management of fisheries and fish stocks specifically [6]. Fisheries management efforts are complicated by a number of factors including the need to find mutually beneficial solutions for sharing a common resource across a variety of industry and governmental systems with different interests. [7]. Additional factors affecting the effectiveness of fisheries management measures include climate change/environmental conditions, social support systems, economic trends and the legal obligations of honoring international trade agreements [8]. In addition to these complex factors, fisheries are required to comply with multiple laws that directly and indirectly affect their fishing activities.

Legislation such as Magnuson-Stevens Act, the Marine Mammal Protection Act, and the Endangered Species Act affect where, when, and how fishing vessels can operate. Fishing operations are also affected by impacts from and competition with other marine uses such as offshore energy development governed by the Outer Continental Shelf Lands Act. Each law includes separate objectives to achieve desired social and biological outcomes that must be balanced when developing fishing regulations. For example, while the Magnuson-Stevens Act outlines how to effectively manage fisheries, the Endangered Species Act and the Marine Mammal Protection Act requires fisheries to implement measures to minimize interactions with and mortality for endangered or threatened species and marine mammals. Further, the Magnuson-Stevens Act outlines 10 National Standards that each fishery regulation must address such as preventing overfishing and rebuilding overfished stocks, minimizing costs and adverse economic impacts, providing for the sustained participation of fishing communities, and promoting safe fishing operations. Due to the need to comply with multiple and varied legislative objectives, fisheries regulations are often subject to ongoing litigation that affect when and how regulations are applied, creating a highly dynamic regulatory environment for vessel captains to navigate [9]. Moreover, these laws include opportunities for the public to comment on and suggest revisions to proposed regulations, placing further demands and stress on fishery participants.

Regardless of these complexities, a governance process that lacks inclusion and diversity of inputs runs the risk of triggering unintended and negative impacts [1]. Inclusivity in the governance process increases the potential for developing regulations that work from a variety of perspectives, thus operationalizing "knowledge pluralism" as described by Kidd et al. [8]. Inclusivity also reduces the need for more intensive enforcement of regulations or quotas, as all parties are more likely to see the benefit of management decisions [4,5].

In light of the call for increased stakeholder engagement with the governance process, we present data that was originally collected to explore the impact of sleep deprivation in several U.S. fisheries. While conducting interviews for this study, informants frequently commented on perceived linkages between government regulations and the impact of these regulations and the governance process on their emotional well-being. Data from this study was then augmented with additional interviews to more fully characterize fishermen's perspectives on the governance process and the impact on their perceived levels of stress and overall health. In line with the framework of the FAO 2016 study of regulatory impacts on fishing safety,[1] our assessment looks at the widespread and indirect impact of overall governance processes on fishermen in three U.S. fishing industries. By highlighting these

perspectives, the authors of this article hope to provide a foundation for further studies that explore links between stress, fishermen's health and the governance process. We argue that while engagement is generally perceived as a beneficial enterprise, for the informants in our study, the governance process is viewed negatively. We also highlight the need to address these issues in order to ensure fishermen's ongoing engagement with the governance process, if engagement is indeed a crucial factor in governance success.

## 2. Materials and methods

Researchers from the Northeast Center for Occupational Health and Safety: Agriculture Forestry and Fishing, Oregon State University/Pacific Northwest Agricultural Safety and Health Center, Alaska Marine Safety Education Association (AMSEA) and George Mason University have been conducting research with commercial fisheries on the East and West Coasts of the United States in order to address the current gap in knowledge regarding sleep deprivation and fishermen's health and safety. Fishermen involved in this research include salmon gillnetters in Alaska, Dungeness crab fishermen in Oregon and Atlantic scallop and offshore lobster fishermen in Massachusetts. These fisheries were specifically selected to capture information from fishing crews who are most likely to be sleeping on the vessel with days at sea ranging anywhere from several days to longer than a week. In the initial stages of the research process, safety researchers conducted in-depth interviews with fishermen from all four fisheries to assess various factors that affect their sleep.

The data collection process began with the development of an interview guide, which was created to align with study objectives (i.e. identifying fishermen's perceived associations between sleep patterns, sleep hygiene, and health and safety). Questions were outlined and discussed by study collaborators on both the east and west coasts and largely included questions on work patterns, sleep schedules and perceptions of the impact sleep deprivation has on their job performance and health. Once a rough draft of the moderator's guide was developed, researchers piloted the interview guide with commercial fishermen to ensure questions were clear and likely to capture the information sought by the research team. Participants were also asked to comment on a health assessment survey being developed by the study team to collect measures of sleep patterns and overall health in the fisheries being studied.

Once the moderator's guide was completed, researchers were asked to randomly select crew or captains from the identified fishery sector in their region. Subjects were either drawn from the AMSEA database (the list contains the names of 24,000 fishermen who have completed required safety training) or from previous industry contacts. Once identified, potential participants were sent information packets containing a brief summary of the research, a letter of invitation, an informed consent form, an abbreviated moderator's guide and the draft of the health assessment. Each potential participant was then contacted by phone to assess their interest in participating in the study. Interviews were set up at times and locations convenient to fishermen and due to the COVID-19 pandemic, many interviews were conducted over the phone. Subjects consented to the interviews, and all interviews were recorded, transcribed and uploaded into NVIVO [10] for analysis. In all, roughly five interviews were completed per fishery sector for a total of 21 interviews.

Interview data was uploaded into NVIVO and the Project Coordinator coded all interview transcripts. Codes were reviewed by other study team members to ensure that assigned codes accurately reflected the information in the associated segment of text. Codes included a combination of a priori and open codes to develop primary and organic themes emerging from the data. A priori codes included: sleep strategies, sleep patterns, intersection of sleep and health, intersection of sleep and safety. However, in the process of coding these interviews, several organic themes emerged in the open coding process with one of the most

prominent being perceptions of linkages between government regulations, stress and fisheries health and safety concerns.

Given the prominence of the theme relating to fisheries management, governance and stress, the research team followed up with fishermen who had been previously interviewed and who had shared concerns about regulations, stress and sleep to explore this theme further. Ten of the original 21 participants were successfully recontacted. Of those fishermen who were recontacted, one was no longer fishing, two had scheduling conflicts, while the remaining seven agreed to follow-up, qualitative interviews. This second round of follow-up interviews included fishermen from salmon, scallop and lobster fisheries. These interviews explored whether regulations and governance impacts were direct (such as changing how long fishermen are out to sea or how many crew they are fishing with), or indirect, (such as increasing financial stress and fatigue caused by regulatory burdens). Fishermen were also asked to provide additional details on how the governance process could be changed in order to reduce stress and improve fishermen's limited opportunities for restful and productive sleep/rest periods. While only excerpts from the follow-up interviews were used in this paper, the themes raised in these interviews were similar to those raised in initial interviews. These themes were consistent across interviews and no new themes emerged as interviews proceeded, which provides confirmation of saturation. Our findings mirror those of other similar studies, as described in the Discussion section, which offers further support for generalizability. All aspects of the study were monitored by the Mary Imogene Bassett Hospital Institutional Review Board (Reference #1481898-1).

### 3. Results

In general, the fishermen interviewed for this study appeared very eager to share their experiences relating to governance and regulation of the fishing industry. Interviews pointed to several key themes that most succinctly captured the fisheries management governance process from participants' perspectives. As described in the review of these key themes below, fishermen felt they have very little valued or meaningful input in regard to fisheries governance. This marginalization is perceived as a primary driver of their financial and emotional stress, as they believe they have little control over decisions that greatly impact their welfare. The following themes provide a more specific understanding of what fisheries governance is like from their perspective and the implications for their health.

#### 3.1. Barriers to participation in governance

One of the most prominent themes that emerged from interviews with fishermen was that there are numerous barriers to participating in fisheries management meetings. These barriers are diverse and can include very real logistical barriers, as well as perceived barriers that come from negative prior experiences with fisheries governance. Collectively these barriers make it not only difficult to be active participants in fisheries management discussions, but also create financial and emotional stress even before fisheries management decisions have been codified and put into practice. We describe each of these barriers, offering examples and quotes to provide a clear picture of fishermen's governance experiences.

##### 3.1.1. Logistical barriers

According to our informants, the opportunities fishermen have for giving individual input on fisheries management decisions are largely provided in open forums, where public comment is permitted. According to fishermen, participating in these forums can be difficult as they often conflict with other fisheries meetings or with time that would normally be spent fishing or attending to other commitments. Fishermen's schedules can also fluctuate considerably given the fact that their work is weather dependent. If the weather permits, they need to fish, as

not fishing leads to financial loss. The cost of attending meetings is also a considerable barrier to participating in fisheries management meetings. This is particularly frustrating for fishermen as they point out fisheries management personnel are paid for their time in meetings, while fishermen are not. Travel, lodging and meals are also covered for fisheries management personnel, while this is not the case for fishermen. Attending meetings often requires fishermen to absorb both the loss of income from taking time off work to attend and the cost of transport, lodging or other costs. According to the fishermen interviewed, these barriers significantly impede opportunities to participate in the governance process.

*Fisherman: "They're the ones that are clocking time. They're the ones that get a paycheck. They get a federal pension...They are getting paid to be there while we sit there for free. A lot of times we sit there and we either lose a day fishing, sometimes a few days. We have to commute, we have to pay for all our hotel rooms, we have to pay for our own to be there. We have to give up paychecks ourselves to go beg for forgiveness or beg for mercy or whatever it is and not be heard properly."*

*Fisherman: "Management meetings are held in different locations like Anchorage which makes it difficult for me to attend due to the cost of air travel and lodging so it's expensive to attend meetings."*

In addition to the financial barriers, the social distancing requirements driven by the COVID-19 pandemic led to technological barriers as fisheries management meetings transitioned to online formats, such as Zoom. This change in meeting format created further barriers for some, as fishermen either lacked the technology or the know-how to actively participate in online discussion platforms.

*Fisherman: "We tried having Zoom meetings, half the people can't figure it out."*

##### 3.1.2. Perceived barriers

Interviews with fishermen also identified barriers that were driven by their discomfort or lack of experience with public speaking and debating with scientists in public forums. As described by the fishermen, these forums can be intimidating for individuals who lead a somewhat solitary existence on the sea. In these interviews, it is clear that while public forums and presenting scientific data may be activities that regulators are comfortable with, for fishermen these interactions can be uncomfortable at best or hostile at worst.

*Fisherman: "Even me, I've been doing it 20 some years, and it's still tricky once in a while, you know? Depending on the issue. But for someone like my brother, for example, he gets up there and he stumbles and stutters...I feel bad for him, you know? What he has to say is valuable, but it comes out not quite so much, you know?"*

*Fisherman: "...as a group most [fishermen] are not college educated, a lot of them are high school drop outs, ...that doesn't make us stupid."*

*Fisherman: "...there is definitely a certain disconnect between a kid who just got out of college and has a 4 year marine biology degree and did a study on stock assessment and a fisherman who sees what's going on every single day and we make our livelihood off of knowing what's there and how to react to what we see on the ocean and they can sometimes be condescending. And that's kind of, I'm trying to word this the right way, that's frustrating a lot of times because we've tried to convey to the scientist and the state what we are seeing and sometimes they just tell us that we're just flat out wrong."*

##### 3.1.3. Experiential barriers

In addition to these barriers, fishermen indicate that prior disappointing or frustrating experiences with management discussions also make them less inclined to participate in future governance opportunities. Fishermen offered a number of examples of governance outcomes

that were particularly disappointing, including regulations that are not applied evenly across competing interests (i.e. recreational fishermen), confusion regarding why some regulatory decisions have been made, regulations that are not communicated clearly or in a timely way, and a lack of oversight of regulators when it comes to making regulatory compliance accessible, reasonable or responsive.

*Fisherman: "Some nights you're just like, 'Oh my god, why did I waste my time?' and there are a lot of meetings lately that you walk out of there in complete frustration."*

These experiences not only make fishermen unwilling participants in the governance process, but as one fishermen describes it, they can greatly affect the satisfaction they get from being commercial fishermen.

*Fisherman: "Really, there's nothing else that I would rather do to make a living, [but] what we have to do before we go fishing is, yea, incredibly stressful and I feel like it doesn't have to be. But it's just the way that it is, it's terrible. There was a point that...I came home and I walked up to my wife and said, 'This is the first time that I don't want to do this anymore.'"*

One of the fishermen's most frequently shared frustrations with the governance process, was the feeling that regulators do not understand the realities of commercial fishing, which they feel impacts the utility and wisdom of regulatory decisions.

*Fishermen: "It is just people who are in the regulatory agency... really just don't understand. It's like they're from a different world. People who live out on the ocean have to just live by these rules and then there's the people [who] make them up and the two don't always go hand in hand. And when we try to explain that something is not going to work for us and it... does not always matter to the people who are making these rules and regulations up."*

*Fisherman: "And when you get a phone call or an email from a fisherman concerned about the status of his permit, that's not a phone call from a fisherman about the status of his permit, that's a fisherman concerned about how he is going to feed his kids."*

The collective impact of these experiences can lead fishermen to avoid active participation in the governance process, as the following excerpt illustrates:

*Interviewer: "Now one of the things you suggested that could change this is if people listened and compromised."*

*Fisherman: "They won't."*

*Interviewer: "They won't?"*

*Fisherman: "It's a waste of time."*

### 3.1.4. Transparency in the governance process

While much of the discussion on fisheries management focused on fishermen's barriers to participation, they also shared a general lack of trust in the governance process. This seemed to be largely related to a perceived lack of transparency on the part of regulators regarding how decisions were made, as well as who was involved in the decision-making process. The fishermen raised questions such as: What are their qualifications? Are they members of the community? What other special interests were included in the decision-making process and how were these prioritized? In particular, fishermen wondered about competing interests and felt marginalized by big business and big profit, as well as environmental groups.

*Fisherman: "The federal government wants to sell resource extraction permits (such as for oil), but fishermen have no real voice to prevent it. If the state Governor wants it, he gets it (the resource extraction permits)! We are always worried about our livelihood. For many years now, we have been threatened with oil development taking away our livelihood just so government can make a little money off of it."*

Fishermen were also unclear about how their input had actually been applied in regulatory decisions. In the end, this lack of transparency leads fishermen to feel disenfranchised, with no real voice and no sense of control. Many suspected decisions had already been made before they had even been given the opportunity to provide input.

*Fisherman: "Every time they have a fisheries meeting, you always have the status quo. You just log in..., but if you're at the point where there's going to be a meeting, they already have their minds set. I've written hundreds of letters, phone calls, I've done what I can, and nothing ever seems to change."*

*Fisherman: "Most decisions are already made (before comments are solicited) it feels like. As I said, fishermen are only allowed to make comments on changes every 2 or 3 years. There are no governance bodies specific to the fishery in each area..."*

### 3.2. Governance outcomes

While fishermen shared many observations and examples of barriers to participation in the governance process, they also offered a few examples of governance outcomes that were sources of frustration. One specific example was the sheer quantity and poor timing of regulatory announcements.

*Fisherman: "There's more to know and it's a full time job to keep up on regulations. You're calling friends or the port saying, 'Can we keep this?', 'How much can we have of that?', or 'Do we have that license?'. So, it's a lot to pay attention to, and like I said, the kill and release, you got it on deck, and a lot of times you have the wrong information and throw the stuff overboard that we could've brought in, and a lot of times we throw it overboard and then they change it and you could've landed it by the time you get in."*

*Fisherman: "From January 15<sup>th</sup> until May 1<sup>st</sup>, we can't go fishing and they wait until the beginning of April to give us the new regulations to outfit our gear. So we had all winter long we could have been doing this gear work and they waited until 4 weeks before we went fishing to tell us what we had to do. So then everyone had to scramble because during that month we're usually working on our boats, we're working on our traps and so we had to either hire extra hands or work extra hours to be in compliance with all these new regulations that they put on us."*

Although many of the examples that were shared appeared to have a negative impact on commercial fisheries, some fishermen provided a few positive examples of governance outcomes.

*Fisherman: "Sometimes something good gets passed. Like being able to have 2 fishing permits on one boat which makes fishing more efficient."*

*Fisherman: "So, the last time we had a stock assessment, which was 5 years ago, the benchmark one. I was actually kind of, I wasn't proud of them, but I was impressed because they acknowledged that it was climate change that was the reason for the decline in lobster fishing, not the fishermen."*

Of particular note, was the discussion of the benefits of internal regulation of fisheries, which they believed led to sound, workable fisheries management guidelines.

*Fisherman: "[A Fishing Association] is made up of a panel of delegates and most of them are still active fishermen and we do actually get a pretty good amount of input into certain things...as far as the actual regulations of the fishery, we get a really good amount of input and I think they do a really good job of listening to us and as far as things like, the legal size of lobster, and the keeping of egg-bearing females, and things like trap limits and what not. I think most of us as fishermen are on the same page of, you know, the regulations we have in place right now are working very, very well to ensure that the resource is sustained and that we will have a healthy stock for generations to come."*

### 3.3. Governance and fishermen's health

As described in the introduction to this manuscript, our original research objective was to explore the health and safety impacts of sleep deprivation in commercial fisheries in four different fisheries sectors on the East and West Coasts. Initial qualitative interviews on this topic pointed to the particular impact that stress has on fishermen's sleep quality. One primary stressor described in these interviews was increasing regulation and a lack of input in the governance process. As we have described in the major themes already presented, there are a number of concerns fishermen have regarding how regulations are made and how this impacts their lives and health. Although fishermen routinely struggle with stressors like market fluctuations, equipment failures, labor shortages and family concerns, regulation and fishermen's perceived lack of input appear to coalesce in ways that make stress levels almost intolerable for some fishermen.

*Fisherman: "That's the one thing we all have in common, we are miserable, we're depressed and we're all suffering from sleep deprivation and that all falls under that sleep deprivation umbrella because our lives are not certain."*

*Fisherman: "Everything you think about now today, you're not thinking about your retirement, you're not thinking about your grandkids, you're not thinking about vacation or what the next business day is going to be. It's like what the hell kind of shoe is going to fall next and what kind of crazy idea are they going to implement on us now."*

*Fisherman: "I sleep two to three hours a night, broken sleep. You just, you're laying in bed at night and you feel like you're falling. All the time. You feel like you're free-falling. You're out of control, you don't have control."*

In addition to observing the impact of work stressors and the impact of regulations on their own lives, they also described what they see in the industry as a whole and how this impacts friends, coworkers and commercial fishing communities.

*Fisherman: "Well it is, it is hard, it has to be said.... Its bad, it's there in a big way. Why do so many guys overdose? Why are they drinking as much as they are? Why are they overdosing? Why? Well that's why- they're not happy. They're not happy that they're shoved in a corner somewhere, somebody's telling them what they are going to do and that's just how it is. But that's why all these things happen the way they do because nobody is listening. So they deal with it the way that they can."*

### 3.4. Recommended changes

While fishermen's discussion of the governance process in fisheries management was somewhat bleak, fishermen did offer several suggestions for improvement. These were either focused on the governance process or on ways to soften the blow of fisheries management decisions. In particular, they discussed the value of being able to offer input on fisheries management decisions prior to public meetings, which is common practice for the Mid-Atlantic Council [11]. They also pointed out that financial support for attending meetings (being compensated for their time and travel costs) would greatly improve their ability to be involved in the governance process. Financial support for fishermen during fisheries closures would also greatly decrease fishermen's stress levels. As they pointed out, they are not able to collect unemployment insurance when fishing grounds are closed despite the fact that their income is considerably impacted.

*Fisherman: "I really wish they would just [say], okay, January 1<sup>st</sup> you guys are done. Everybody out of the pool. You get paid six months unemployment, we'll see you guys July 1<sup>st</sup>. That would be the easiest thing to do, we wouldn't have to deal with all this foolishness, and it would be such an easy solution for everybody."*

They also recommended switching to hybrid public forums, a current practice in some regions that allows for both online and in-person access for those individuals who struggle with online meeting platforms. Informants also pointed out that more careful consideration of when to schedule fisheries management public forums could improve their ability to participate, such as avoiding times when other fishing meetings are scheduled or scheduling them in the evening when fishermen aren't working, but early enough that they can get on the water to work the next day.

*Fishermen: "Yeah. So meeting times would be one thing that could change, certainly to be more, better matched to a fisherman's schedule."*

Increased transparency on how and why fisheries management decisions have been made, could greatly increase fishermen's trust in the governance process. Clear and concise details about regulatory changes and considerable advance notice of these changes would also reduce the levels of regulatory stress that fishermen frequently described.

While generally frustrated with fisheries management, fishermen acknowledged that fisheries regulators often have little room for flexibility given the availability of fish stocks. As indicated by one fishermen, perhaps the best strategy is for fishermen to accept this reality and to work with the government to ease the transition financially and emotionally.

*Fisherman: "...just being more involved, I view the long-term direction of where it's going. That's why I tell all the young people, come up with a Plan B, because I don't see fishing or lobstering especially, as it is now, or as it has been, for the next 15–20 years. It's going to be non-existent eventually."*

Overall, these interviews made it overwhelmingly clear that there is much to improve in the fisheries management governance process. While it may be difficult to change some regulations and the underlying legislation that drives them, fishermen's observations provide several helpful options for potentially ameliorating regulatory impacts on fisheries workers and captains. Their words underscore the extreme need for rethinking the governance process in a timely fashion.

## 4. Discussion

This study was prompted by our first attempt to learn about sleep deprivation, a major concern for the health and safety of commercial fishermen. Hearing that fishermen across the US are experiencing considerable stress from regulations and fisheries management led to the data collection and analysis for this work. Our findings are consistent with other studies that have examined the association between fisheries governance processes, regulatory outcomes and the associated mental health impacts to commercial fishermen.

As described in a recent review of the literature, the connection between regulations and mental health or factors contributing to psychological health in these communities has been noted in other studies [12]. One such study was conducted in 2003. This study observed similar connections between fishermen's stress levels and fishing access restrictions [13]. Another study conducted with commercial wild-catch fishermen in Australia [14], found that fishermen experience a number of perceived stressors. This study indicated the percent of fishermen experiencing "high or very high" levels of psychological distress was roughly twice the percentage of Australians reporting the same. Factors listed as sources of stress were compressed into several larger themes and included 'traditional risks' and 'modern uncertainties'. While stressors related to traditional risks (such as weather, long hours and crew relationships) were noted, modern uncertainties (such as government regulation and future regulatory changes) were most commonly cited as inducing stress. Skippers and inshore fishermen appeared to be more significantly impacted by regulatory pressures than crew and offshore fishermen, according to the study.

In another study conducted by Pollnac et al [15], researchers found

that marine governance is an important variable in predicting job satisfaction and fishermen's well-being. This was true for fishermen in the Northeast, as well as Alaska, two of the populations included in our study. Although researchers acknowledge that the relationships between fisheries management, job satisfaction and social and individual attributes are complex, they call for careful consideration of the role that fisheries management decisions play in the health and welfare of fisheries communities. These same conclusions and a call for more considered fisheries governance that is responsive to fishermen's health and well-being are highlighted in another study by Pollnac, Seara and Colburn [16].

In a study conducted by Young et al. [17], authors note "that participation in co-management processes can expose stakeholders to significant personal stress, and that this problem is sufficiently serious to warrant greater research and policy attention." [18] In another article written by Wilson and McCay, the authors point out that the interpretation of "participation" is hardly straight-forward and can run the spectrum from "working together" to "obstructing the management process" [19].

However, existing studies also note a gap in mental health research and the role of regulatory impacts on fishing communities in the "Global South" [20] or in developing countries [21]. These studies underscore the need to not only increase our knowledge of the psychological health of fishers, in general, but in underserved countries specifically.

In summary, our interviews with fishermen across three US fisheries were enlightening. The conversations highlighted important barriers, impacts and suggestions for the improvement of the existing fisheries governance structure and associated processes. According to our study, the entities responsible for fisheries management and governance could benefit from improving participation in management decisions by all parties, but most importantly fishermen. Potentially beneficial changes to the governance process include reducing barriers to participation and making the process more accessible, transparent and responsive to stakeholder input. Our study also indicates that without these improvements, fishermen are likely to experience potential health impacts and to disengage from the governance process.

#### 4.1. Limitations

Since study participants were a subsample from an established study, the fishermen interviewed do not represent all fisheries in the US and all experiences. Further qualitative and quantitative work could be conducted with more fishermen and other fisheries to better represent diverse fishermen voices and to confirm common themes. Additionally, since the fishermen interviewed had been previously interviewed specifically about sleep disruptions, broader health and safety concerns may not have been fully revealed.

## 5. Conclusions

Commercial fishermen are eager to share their governance practice experiences and value being able to influence management decisions. Consideration of how to improve the experiences of all stakeholders should be explored. Many of the barriers described by fishermen in this study are surmountable. In particular, the transparency and communication channels around governance can be and to some extent already have been improved. The Magnuson-Stevens Act provides further impetus for collective input, as fishermen's perspectives can provide valuable insight on the potential safety impacts of fisheries management decisions. The experiences shared by the fishermen in this manuscript can serve as a starting point for continued research and understanding of fishermen's experiences with the governance process and potentially to more immediate, easily applied solutions for improving participation.

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## CRediT authorship contribution statement

**Julie Sorensen:** Conceptualization, Methodology, Validation, Formal analysis, Investigation, Resources, Writing – original draft, Writing – review & editing, Visualization, Supervision, Administration, Funding acquisition. **Kincl L:** Conceptualization, Writing – original draft, Writing – review & editing. **Weil R:** Validation, Formal analysis, Investigation, Writing – review & editing. **Dzagan J:** Validation, Investigation, Writing – review & editing. **Christel D:** Validation, Investigation, Writing – review & editing.

## Competing Interest Statement

The authors of this manuscript have no competing interests to declare.

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