Stewardship, advocacy, and knowledge in Juneau-area fisheries

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A thesis

submitted in partial fulfillment of the

requirements for the degree of

Master of Marine Affairs

University of Washington

2023

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Program Authorized to Offer Degree:

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Abstract

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Local environmental stewardship supports resilience of social-ecological systems through a wide range of actions that benefit both environmental and human wellbeing, and has been recognized as an important component in building adaptive capacity of fisheries and fishing communities facing myriad threats and stressors from global climate change. Stewardship actions of resource users can provide both environmental protection and continued use of and access to resources by coastal communities. In Southeast Alaska, where commercial fishing plays a key role in cultures and economies, concerns for local fisheries have arisen from declines in salmon returns, high ex vessel price variability, and barriers to participation for young fishers, among other issues. In this study, we aimed to understand the existing and potential pathways for stewardship actions of small-boat commercial fishers in Juneau, Alaska. We conducted semi-structured interviews with 18 commercial fishers, agency staff, and leaders of seafood associations to: 1) Document fisher-

led stewardship actions and ways that small-boat commercial fishers engage formally and informally with local management, 2) Explore the role of fishery management agencies in facilitating collaboration and communication with fishers in the Juneau area, and 3) Identify areas where the stewardship capacities of the fishery system can be better supported in order to work towards desired ecological, social, and economic outcomes. We found that a number of pathways for stewardship efforts exist in commercial salmon and shellfish fisheries, including formal and informal interactions with Alaska Department of Fish and Game (ADF&G) staff, participation in Advisory Council (AC) and Alaska Board of Fisheries (BOF) meetings, participation in fishing associations and advocacy organizations, knowledge sharing among commercial fishers, and taking personal conservation actions to care for fisheries. We identified areas of relatively low social, financial, and institutional capital that may limit the effectiveness of these stewardship actions for some participants. Additionally, our findings highlight diverse perspectives of fishery participants on how these stewardship actions might be better supported through policy, advocacy, and collaboration.

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Abstract

Local environmental stewardship supports resilience of social-ecological systems through a wide range of actions that benefit both environmental and human wellbeing, and has been recognized as an important component in building adaptive capacity of fisheries and fishing communities facing myriad threats and stressors from global climate change. Stewardship actions of resource users can provide both environmental protection and continued use of and access to resources by coastal communities. In Southeast Alaska, where commercial fishing plays a key role in cultures and economies, concerns for local fisheries have arisen from declines in salmon returns, high ex vessel price variability, and barriers to participation for young fishers, among other issues. In this study, we aimed to understand the existing and potential pathways for stewardship actions of small-boat commercial fishers in Juneau, Alaska. We conducted semi-structured interviews with 18 commercial fishers, agency staff, and leaders of seafood associations to: 1) Document fisher-led stewardship actions and ways that small-boat commercial fishers engage formally and informally with local management, 2) Explore the role of fishery management agencies in facilitating collaboration and communication with fishers in the Juneau area, and 3) Identify areas where the stewardship capacities of the fishery system can be better supported in order to work towards desired ecological, social, and economic outcomes. We found that a number of pathways for stewardship efforts exist in commercial salmon and shellfish fisheries, including formal and informal interactions with Alaska Department of Fish and Game (ADF&G) staff, participation in Advisory Council (AC) and Alaska Board of Fisheries (BOF) meetings, participation in fishing associations and advocacy organizations, knowledge sharing among

commercial fishers, and taking personal conservation actions to care for fisheries. We identified areas of relatively low social, financial, and institutional capital that may limit the effectiveness of these stewardship actions for some participants. Additionally, our findings highlight diverse perspectives of fishery participants on how these stewardship actions might be better supported through policy, advocacy, and collaboration.

Introduction

Local environmental stewardship supports resilience of social-ecological systems through a wide range of actions that benefit both environmental and human wellbeing (Bennett et al. 2018, Mathevet et al. 2018). These actions vary widely across scale, ecosystems, and participants, while also supporting a broad range of goals. Examples of stewardship actions range from participation in voluntary beach clean ups (Jorgensen et al. 2021) and managing urban green spaces and community gardens (Krasny and Tidball 2012) to far-reaching global efforts aimed at sustainable use of marine resources (FAO 2015). While the concept of stewardship has been largely defined in terms of actions related to ecological conservation, it has also been considered in a broader sense to include actions that sustain human relationships with and use of the environment (e.g., Bennett et al. 2018). These actions can come in the form of political engagement and advocacy, and have been shown to increase knowledge exchange and relationship-building among resource users, scientists, and managers (Runnebaum et al. 2019, Randolph 2004, Van Kerkhoff and Lebel 2006).

Stewardship has been recognized as a component of building adaptive capacity of fisheries and fishing communities facing myriad stressors, including global climate change. The adaptive capacity of a system refers to "people's ability to anticipate and respond to change; to recover from and minimize the consequences of change; and to take advantage of new

opportunities" (Smit and Wandel 2006, summarized by Barnes et al. 2020, p. 823). Fishers' extensive place-based knowledge guides stewardship practices that involve deliberate choices to fish in ways that may afford conservation benefits, but are not required by regulations. For example, commercial and recreational rockfish fishers in Alaska and Washington, USA, have collected bathymetric data to avoid areas known to produce high bycatch, reduced targeting of larger, older fish, and used deep-water release mechanisms to minimize release mortality before they were required by regulation (Sawchuk et al. 2015, Beaudreau et al. 2018, Gordon et al. 2022). In Scotland, fishers in the Loch Torridon prawn fishery created their own voluntary code of conduct, where the fishers have agreed upon maximum numbers of sets, traps, and fishing days per year (Bennett and Hough 2008). In addition to the more concrete benefits accrued by stewardship, these actions are a way for fishers to express care for a natural resource that is crucial to their way of life, and that they hope to support (Hart 2021).

Despite its many benefits, stewardship may be constrained in fisheries that are impacted by a range of social and environmental pressures. The ability of fishery participants to take stewardship actions and the effectiveness of these actions are influenced by "the speed, scale, severity, complexity, and predictability of the social and ecological changes that are occurring" within a system (Bennett et al. 2018, p. 604). Accordingly, the decreased predictability of fisheries systems resulting from climate change (Brander 2007), alongside the complexity associated with these changes could limit the stewardship capacity of fisheries systems. Social factors, such as age, financial status, and employment, may all impact the extent to which individuals participate in environmental stewardship, or the specifics of what stewardship actions they choose to take (Clinch 2021). Additionally, institutional and cultural barriers in fisheries management may inequitably limit stewardship in the form of policy engagement for

communities and individual fishers (Krupa et al. 2020). Understanding the capacity for stewardship within fisheries systems requires understanding of factors that motivate and constrain environmental stewardship actions, and consideration of how multiple stressors may impact the prevalence and effectiveness of these actions.

These issues are relevant to Alaska fisheries, which are affected by overlapping environmental, socioeconomic, and regulatory pressures (Beaudreau et al. 2019) that may have implications for individual and collective stewardship capacity. Climate change is negatively impacting many culturally and commercially important species, including Pacific salmon (*Oncorhynchus* spp.) and several species of crab (Irvine and Fukuwaka 2011, Crozier et al. 2021, Szuwalski et al. 2021). Chinook salmon (*O. tshawytscha*) runs have declined throughout the state (Jones et al. 2020) and several salmon species have undergone significant declines in body size since the 1970s (Oke et al. 2020). Crab fisheries in Alaska have also experienced declines, with the 2022 closure of the Bering Sea crab fishery (ADF&G 2022) sparking particular concern (Fedewa et al. 2020, NOAA 2022). Marine heatwaves have had far-reaching impacts on these systems, including smaller and thinner Chinook salmon due to a shift in prey availability (Cavole et al. 2016), as well as declines in commercial harvest of salmon and groundfish species throughout the Gulf of Alaska (Suryan et al. 2021). As climate change increases variability within the ocean (McGowan et al. 1998) scientific uncertainty also increases, thereby requiring greater responsiveness in governance (McIlgorm et al. 2010). This highlights the importance of forward-thinking, flexible management strategies that draw from fishers' knowledge of environmental change and stewardship practices. These stewardship practices are informed by experiential and generational knowledge of fishers about their local ecosystems (Johannes et al. 2000). Understanding the role of local environmental stewardship within a stressed system will

allow for a greater understanding of the overall stewardship capacity, or the factors enabling and limiting stewardship actions by fishery participants, and how they can best be supported by management institutions (Bennett et al. 2018).

In this study, we explored local environmental stewardship within state-managed fisheries in northern Southeast Alaska, focused around the Juneau region, where commercial fisheries are already experiencing the effects of climate change. Juneau, as the state capital with a large presence of government institutions, offers a useful case study for examining intersections of stewardship with formal management institutions in Alaska fisheries (e.g., Gordon et al. 2022). We applied an integrative analytical framework developed by Bennett et al. (2018) to explore the dimensions of local environmental stewardship, which they defined as "actions taken to protect, care for, or responsibly use the environment in pursuit of environmental and/or social outcomes in diverse social–ecological contexts" (p. 599), for Juneau-area fisheries. Within this framework, the outcomes of stewardship depend on the social-ecological context in which stewardship takes place, which includes actors (individuals or groups), their motivations for stewardship, and their capacity to take action (Bennett et al. 2018). Of particular note for this study, an individual's ability to take stewardship actions, as well as the efficacy of these actions, may be influenced by a number of different forms of capital, including social, cultural, financial, physical, and institutional (Bennett et al. 2018). We use the framework to address three objectives: 1) document fisher-led stewardship actions and ways that small-boat commercial fishers engage formally and informally with local management, 2) explore the role of fishery management agencies in facilitating collaboration and communication with fishers in the Juneau area, and 3) identify areas where the stewardship capacities of the fishery system can be better supported in order to work towards desired ecological, social, and economic outcomes.

Study system

Commercial fisheries in Juneau provide important economic value to the city and to individuals, with an estimated ex-vessel value of $20.7 million for all Juneau based fisheries in 2018 (CFEC 2021). Commercial fisheries are also an important job source in Juneau, with 384 commercial fishing permit holders, 376 full year crew license holders, and 604 home-ported vessels in 2017 (ADF&G 2023c). The most prominent small-boat commercial fisheries include salmon (hand troll, power troll, drift gillnet, purse seine) with 143 active permit holders, Dungeness, king, and tanner crab with 29 active permit holders, halibut with 71 active permit holders, and sablefish with 18 active permit holders (CFEC 2020).

Fisheries in state waters (within 3 nmi of shore) are managed by the Alaska Department of Fish and Game (ADF&G) based on regulations set by the Alaska Board of Fisheries (BOF). Regulations set by BOF are based on proposals submitted by Advisory Committees (AC), ADF&G, or any individual or organization who would like to propose a management change. These proposals, along with relevant analyses and written and oral testimony, are presented at regional meetings (ADF&G 2023a). Once decisions are reached by a majority vote of the seven BOF members, ADF&G begins to implement and enforce any new regulations within their regions. Meetings occur on a three year cycle, with a meeting in every region happening once per cycle (ADF&G 2023a). Within this study we focus on fishers who identify their main fishery as either salmon or crab, with the majority of salmon fishers in Juneau participating in the drift gillnet fishery. Notably, salmon fisheries in Alaska are strongly influenced by salmon hatcheries, which release more than one billion fish each year and have been “designed to minimize wild stock interactions and enhance fisheries” (ADF&G 2023b).

Methods

Research participants and semi-structured interviews

Within the social-ecological system of Juneau-area commercial fisheries, major actors include commercial fishermen, ADF&G management staff, and other participants in the seafood sector, including individuals involved in hatchery production, processing, and marketing. We conducted semi-structured interviews (Bernard 2018) with individuals from across these groups and aimed to draw from a diverse set of perspectives within the Juneau-based seafood sector, with a focus on local fisheries. Potential interview participants were initially contacted by mailing invitation letters and study information sheets to 2022 salmon drift gillnet and Dungeness crab pot permit holders (97 individuals). Initial participants from the commercial fishing industry, fishing associations, and management agencies were also recruited through existing contacts of a coauthor (AB) who had lived and conducted fisheries research in Juneau for 9 years. We also posted flyers and held a community meeting at a public library in Juneau to discuss the project and invite participation (June 2022). Subsequent participants were contacted via snowball sampling (Bernard 2018), in which interviewees recommend other participants based on relevant knowledge and industry experience. Interviews took place during a research trip to Juneau during June 2022, and over Zoom from July 2022 to November 2022.

Interviews were designed to gather insights about fisher-led stewardship actions, formal and informal engagement between fishers and managers, and the effects of current fishery stressors on stewardship capacity (Appendix A). A first set of questions focused on gaining an understanding of the participants' background and experiences in Alaska fisheries. For fishers and other members of the seafood sector, we asked questions about all relevant experience, including years in each fishery, regions, seasons, gear types, and target species (and bycatch if

relevant), as well as any other ways individuals had gained their knowledge of commercial fisheries. For management staff, questions were similar, focused on understanding various positions held within their organization, and the species/regions managed. The next set of questions focused on gaining an understanding of stewardship actions being taken within small boat commercial fisheries in Juneau, as well as fisher-management interactions. This included questions about specific stewardship actions or fishing practices geared towards conservation, when and how fishers engaged with agency staff, both formally and informally, and what could be done by management to improve inclusion of fishers' ideas and concerns. For management staff, this section involved asking how they had previously engaged stakeholders in their work, in what contexts managers informally interacted with fishers, and whether these conversations or concerns expressed by fishers influenced management decisions. The last section of the interview was based on gaining a better understanding of the changing nature of Juneau-area fisheries, and involved asking questions about the biggest challenges participants' fisheries are currently facing, whether they had concerns about their (or others') ability to participate in their fishery long term, and what they thought could be done to address these issues. Interviews were conducted by 2-3 researchers (ES, AB, EM), with one researcher leading the interview by primarily asking questions and the other researchers taking hand-written notes and asking clarifying or follow-up questions. The research was approved by the University of Washington Institutional Review Board (IRB ID: STUDY00015546). Before interviews began, researchers reviewed an informed consent form with participants, and explained steps taken to ensure data privacy and precautions taken to ensure anonymity of interview participants. Interviews were recorded with permission, then transcribed for use in thematic content analysis.

Thematic content analysis

Interviews were coded and analyzed using inductive and deductive coding schemes (Braun and Clarke 2006). Deductive coding is based on previous research themes, frameworks, or research questions, whereas inductive coding analyzes data based on themes that are identified while going through the data, rather than fitting data into pre-existing coding frames or the researcher's own preconceived notions (Braun and Clarke 2006). An initial set of deductive codes were created, based on the local environmental stewardship framework of Bennett et al. (2018; Table 1). In this framework, the context of a social-ecological system serves as the backdrop for stewardship actors, their motivations, and the various forms of capital present with the system. Each of these factors then influences what specific stewardship actions are taken, as well as the overall stewardship capacity of the system (Bennett et al. 2018). The forms of capital that either enable or limit the ability of individuals and groups to take effective stewardship actions, as identified by Bennett et al. (2018), are social, cultural, financial, physical, human, and institutional. Codes were created to understand the system context, particularly fishery stressors, actors within the system, their motivations for taking, or not taking stewardship actions, and the various forms of capital. Lastly, stewardship actions already being taken by fisheries participants were coded. Outside of this framework, we also looked at goals or solutions proposed by fisheries participants and professionals, as a way to understand how the long-term viability or the stewardship capacity of the fishery could be increased.

Initial codes were changed, modified, or broken into smaller-subcodes throughout the beginning of the coding process in an inductive manner, in order to better understand and communicate the specific nuances of interview themes. An example of this includes the code "stewardship actions" being broken into the sub-codes: "conservation actions", "political

engagement", and "knowledge production," to more specifically categorize the different types of stewardship actions occurring. The codebook was developed collaboratively by coauthors, and refined over time in order to increase clarity. The codebook development process was also iterative, with codes changing slightly to better reflect recurrent themes as more interviews were analyzed (Cresswell and Cresswell 2018). Coding was performed by the lead author (ES) using Atlas.ti 9, with discussion with other authors (AB, EM) to ensure consistency and comprehensiveness of themes. A cumulative code frequency plot was used to determine that code saturation had been reached with the current number of interviews (Figure 1).

Results

Results are organized following the structure of Bennett and coauthors' (2018) local environmental stewardship framework to understand the system of Juneau-area fisheries through the lens of stewardship (Figure 2). First, we summarize the environmental and socioeconomic fisheries stressors described by interviewees as part of the background context, or setting, for stewardship actions. Next, we describe the intrinsic and extrinsic motivations for taking stewardship action or deterrents to action, as well as the specific stewardship actions being taken by interview participants. We examine how these stewardship actions are impacted by several types of assets and their interactions, particularly social, financial, and institutional capital. Lastly, potential solutions or goals given by participants are described, to better understand what productive change within this system might entail. Each of these individual components are examined together to understand the various factors impacting the stewardship capacity of this system (Figure 2).

Description of interview participants

We interviewed 18 participants for this study. We use the term fishermen to describe interview participants who currently participate in commercial fisheries. This reflects the language that the men and women who were interviewed used to describe themselves. Commercial fishermen (11) primarily participated in salmon and crab fisheries in the Juneau area. Agency staff (4) and other fisheries professionals involved in gear group associations, processing, marketing, and hatchery management (6) all had components of their work focused around Juneau-area fisheries. Three interviewees had experience in both commercial fisheries and other seafood sector employment. Four interviewees self-identified their gender as female (22%) and 14 as male (78%); all self-identified as white. Seventeen participants listed Juneau as their city/town of residence, and one participant listed another community in Southeast Alaska. The age range of participants was 32 to 80 years old. Interview duration ranged from approximately 45 to 90 minutes.

Stressors affecting Juneau-area fisheries

Fisheries stressors represent specific concerns expressed by interviewees that impact Juneau-area fisheries and were broadly categorized as environmental, socioeconomic, and management-related stressors. Environmental stressors mentioned by fishermen, other fisheries professionals, and agency staff were similar. These included changing ocean conditions due to climate change (including warming waters and ocean acidification), lower salmon abundance, less predictability in salmon returns compared to past years and the associated decline in catch, and effects of hatchery salmon on natural-origin fish. Socioeconomic stressors mentioned by fishermen and fisheries professionals included ex vessel price variability, revenue not keeping up with inflation, and both the high startup and operating costs to participate in the fishery. Less

frequently, interviewees noted issues with a lack of racial and gender diversity among fishermen, as well as the power and social dynamics that consistently benefitted older fishermen of a higher socioeconomic status. Management-related stressors included the inability to complete "adequate" sampling at ports and processors, concerns about a lack of influence within the BOF process, reduced time and area of the fishery, and future regulatory uncertainty. Management stressors discussed less frequently included complication of managing salmon across international borders (i.e., under the Pacific Salmon Treaty), and the difficulty of explaining changes in regulations to fishermen when there are discrepancies with what they are seeing on the fishing grounds.

While many stressors affected multiple fisheries, including those in a much broader area than Juneau, stressors and their interactions were also seen as affecting individual fisheries in specific ways. As explained by one gillnet fisherman when asked about the biggest challenges his fishery faced, "It's definitely like price variability, abundance, and then, this fishery in particular—Southeast gillnet—has had just like, a series of declines in both of those things at times" (Interview 04). Other interviewees expressed that they were not only concerned about current stressors, but also future unknowns. One fisheries professional with experience in seafood marketing described the challenge of navigating multiple sources of uncertainty, saying, "I think it's just staying on top of a constantly shifting situation. And there's so many unknowns. There's so much we don't know. As far as like, how a lot of it's unprecedented. So trying to plan for things that we sort of haven't seen before" (Interview 06). An ADF&G staff member highlighted combined ecological and economic pressures, noting a challenging mix of "uncertainty of the fish that are gonna come back, if you're going to be able to pay off all your loans, if you'll ever be able to afford to own your own boat, to purchase your own permit"

(Interview 07). Environmental, socioeconomic, and institutional pressures within this system collectively inform the specific stewardship actions that fishery participants take, and may also limit their capacity for doing so.

Motivations and current stewardship actions

Fishermen and other fishery professionals expressed varying motivations for their stewardship actions, as well as deterrents to stewardship (Table 2). Motivations can be understood as either intrinsic (relating to personal morals and beliefs) or extrinsic (relating to external rewards or benefits). Participants also expressed their reasons for not taking stewardship action, which we coded as stewardship deterrents. Intrinsic motivations expressed by fishermen included hope for future generations to continue fishing, a sense of responsibility for the ecosystem, a drive to make a living harvesting a sustainable natural resource, and the desire to highlight knowledge and perspectives of small-boat fishers. Extrinsic motivations expressed by fishermen included wanting to avoid increased regulations, an interest in improving fishing efficiency (waste reduction), and a hope that stewardship efforts will increase future economic viability of the fishery. Stewardship deterrents for fishermen included lack of time due to holding multiple jobs outside of fishing, concerns that they will not be "heard" by the management system, and the cost of traveling to meetings to advocate for their fishery.

Current stewardship actions described by interviewees could be categorized as conservation actions, knowledge production, and political engagement. Conservation actions included suggesting areas for managers to close based on Chinook salmon catch rates, cutting halibut loose instead of shaking them off the hook to prevent jaw injuries in released fish, releasing live Chinook salmon caught in gillnets because they were not the target species,

choosing to fish in a fishery that selectively targets hatchery salmon, and switching to gear types with lower bycatch. As a terminal harvest fishery, the salmon drift gillnet fishery was repeatedly referred to as a low bycatch fishery by both fishermen and management staff, and described as "a super clean fishery compared to a lot" by one fishery participant. Several interviewees noted that specific fishing practices focused on ecological conservation were likely less common or necessary in salmon fisheries because of the low rates of incidental catch. Examples of knowledge production as a form of stewardship included fishermen volunteering to assist ADF&G with sampling studies, fishermen sharing knowledge with management of where they had the highest catch rates of Chinook salmon to inform time and area closures, and advocating to ADF&G for improvements in biological data collection and inputs to population estimation models. Stewardship through political engagement was by far the most common example of local ecological stewardship shared by interview participants. These political engagement actions included expressing needs and concerns to ADF&G staff, participating in AC meetings, submitting regulatory proposals, attending or providing testimony at BOF meetings, and participating in fishing associations and advocacy organizations. These types of actions are particularly important in ensuring the continued use of and access to these resources, as they are often taken with the goal of ensuring that time and area closures, or changes in allocations across sectors, did not lower harvest so significantly that the fishery is no longer economically viable.

Forms of capital affecting stewardship

Various forms of capital within a fishery system can enable the ability of actors to participate in stewardship actions. Conversely, the absence of such assets can limit stewardship capacity. In coding interviews, the forms of capital we most commonly identified were social

capital, financial capital, and institutional capital (Table 3). Here, we discuss these forms of capital as they relate to Juneau-area fisheries, as well as the ways in which they are enabled or limited by existing social-ecological dynamics, as described by interview participants.

1. *Social capital*

Social capital encompasses informal and formal relationships within the system that support stewardship. Social capital between fishermen and managers was enabled by several factors, including existing institutional arrangements that provide opportunities for interaction within formal decision-making bodies and in informal settings. Fishermen noted the ability to share their concerns and knowledge of management practices with agency staff on a regular basis through office visits or phone calls, and the ability for individual fishermen to attend task force meetings where management staff meet with fishermen to go over regulations for the upcoming season, provide explanations for changes, and respond to questions or concerns from fishermen. Most fishermen, even those who expressed concerns or tension with management, noted that agency staff are a part of the broader local community and viewed fishermen and agency staff as two groups who share "a common goal." Opportunities for fishermen to talk with agency staff outside of formal settings were noted as being particularly important by some fishermen. As one fisherman with leadership experience in fishing associations explained, "We encourage people to go to [meetings held by ADF&G]… outside the meetings, it's also a good opportunity to sit down with those guys [ADF&G staff] and have a beer and get to know them a little bit, and really be frank. And it's without any repercussions or anything like that" (Interview 14). In Juneau these informal interactions were noted as fairly common by both ADF&G and fishermen, largely because of management's presence in the small city.

Agency staff also described factors that contribute to social capital, including time spent at the docks and on the water talking to fishermen, providing assistance or giving feedback on fishermen's BOF proposals, actively working to include a diverse set of stakeholders at meetings, sending out information to fishermen ahead of meetings so they are not met by surprises, and maintaining ongoing and long-term relationships with individual fishermen. A specific example was given by a staff member, who described the value of engagement with fishermen on the fishing grounds, saying, "Basically every day that there's an opening we're out there on the grounds chatting with them, so we have a pretty good rapport with local fishermen" (Interview 01).

Factors limiting social capital between fishermen and management were frequently noted by interviewees. The major, recurring factor noted by agency staff was fishers' lack of knowledge or trust about why managers are making certain decisions. Fishermen also discussed their experiences of inaction by ADF&G in response to concerns expressed by fishermen, and implementation of rules or regulations that do not align with fishermen's experiences and observations. For example, one fisherman described a time when crabbing was shut down in a single district because of the low numbers reported back. However, the decision for crabbing in this area to be shut down was based on total catch, and did not factor in how effort differed between the different regions. As a result, fishermen were left unable to fish in an area where they had been experiencing high catch. Despite the fact that both groups are broadly working towards similar goals of fishing sustainably while allowing for the most opportunity, one commercial fisherman said, "It's a complicated relationship. And there's a natural tension," adding that conversations between fishermen frequently include sentiments towards ADF&G such as, "They never get it right, we always know better, we don't get enough time [to fish], we

don't get enough area, there's more fish than they think… the list goes on and on and on and on" (Interview 03). A lack of social cohesion between fishers and managers may reduce overall stewardship capacity by limiting communication and knowledge-sharing between these groups.

Interviewees also noted limitations in social capital among fishermen, or between different groups of fishermen, that arose from differences in opinions or ethical stances related to fishing (e.g., views on hatchery production, preferred target species, and bycatch), differences in financial status, sexism within the fleet, and a feeling that many fishermen are only looking out for themselves, rather than the overall good of the fishery. Additionally, this sense of limited social capital was attributed to the overall culture of the fleet, with one fisherman referring to the fleet as "pretty fractious" and noting that "small boat fishermen are notoriously, and to a fault, independent" (Interview 02). Limited social capital among fishers may negatively impact the stewardship capacity of this fishery by creating barriers to fishermen advocating for the needs of themselves and their fisheries. Instead of coming together to express their needs as a unified entity, fishermen's concerns expressed to management were described by the same fisherman as "random scatter shots coming out of a series of individuals, which is increasingly easy to ignore" (Interview 02).

Throughout interviews, strong social connections among Juneau fishing fleets were not expressed. Instead, interview participants discussed the hypothetical benefits of having a more socially cohesive local industry, such as presenting more unified arguments to management bodies, or collaborating on cohesive proposals for BOF meetings. The importance of improving social capital between fishermen and BOF members was also discussed. Both agency staff and fishermen identified informal conversations between fishermen and BOF as opportunities that could be influential in management decisions. Notably, interviewees shared that these important

social connections exist in other fisheries, but that they are uncommon in Juneau small boat fisheries. When talking about higher earning fisheries, one fisherman noted that when there are disagreements within the fleets, "there's enough money on the line where even all those same people can put their differences aside and see the dollars. Like…we gotta work together to get these dollars" (Interview 05). As a result, participants in these fisheries are better able to come together and express their needs and desires to management. This is in contrast to the smaller, lower earning fishery the same fisherman is a part of, where, "it's just not a big enough fishery for that to happen. We're still fighting amongst each other" (Interview 05). The large variation in views of what would benefit Juneau fisheries, in combination with variable financial capacity among fleets and individuals, further limits the social cohesion of these fishermen.

2. *Financial capital*

Financial capital, referring to the availability of financial resources accessible to an individual or a group, was brought up frequently – often as a source of concern – by many of the interviewees. Overall, examples of financial capital that enable the stewardship capacity of the local system were not discussed by participants. Instead, when talking about financial capital as an enabling factor for stewardship capacity, examples were given for fisheries, fleets, and communities outside of Juneau. Fishermen referenced financial capital as a way that other fleets are able to pay for lawyers and lobbyists to help maintain or enhance their allocations. As one fisherman described, "I think that the wealthier fisheries definitely have better access to regulators, and that drives policy. And like, those of us who have had to take second jobs or whatever it is to make this thing go, don't have the extra time to organize, to develop the kind of financial war chest that you need to compete in that arena" (Interview 04). Another noted that other fishery sectors were able to increase their allocations through lobbying activities and

donations to political campaigns, but that salmon gillnetters would never be in a position to do something similar.

Juneau-area fishermen we interviewed often self-identified either their own financial capital, or the financial capital of their fleet as being low or lower than other fleets. Specific financial concerns expressed by fishermen included shifting allocation of salmon among different commercial fishing gear-groups as a major limiting factor in building their fleet's financial capital, as well as the high variability in ex-vessel prices. One salmon gillnet fisherman told us, "you gotta give people a living wage… enough needs to be allocated to small-boat fisheries that they can make a go" (Interview 04) and another described the biggest stressor he was currently facing as "reallocation…of the salmon resource itself… the Board of Fish process, they're having fish allocated away" (Interview 16). Financial stress was expressed by many fishermen, with several specifically saying that in its current status, staying in the fishery was not financially viable as a sole source of income. However, there were examples fishermen gave of their own individual strategies enabling financial capacity, including moving towards more direct-marketing sales and developing relationships with a more diverse set of potential buyers. Financial stability was discussed as being directly important for several reasons, including the ability to diversify a fishing portfolio through buying new permits and gear, and to be able to continue fishing even in years with lower salmon runs. Additionally, lower financial capital, both on an individual level and a fleet level was discussed as a reason for fishermen seeking jobs outside of the seafood industry during the offseason, in order to supplement income. Several fishermen also expressed that they would like to see ADF&G be able to do more research, or specific projects, but were aware of limited agency budgets. Knowledge and data gaps that arise

as a result of agency budget limitations contribute to skepticism from the fleet and can challenge the ability of ADF&G staff to make informed decisions.

3. *Institutional capital*

Institutional capital refers to what each actor is able to do through currently established management processes and regulations that enhance the stewardship abilities of these actors. Both fishermen and agency staff discussed ways that "sustainability" is built into the overarching framework of fishery management in Alaska. One agency staff explained this, saying, "It's laid out in our core mission—as the Division of Commercial Fisheries that's like our core mission statement—to develop sustainable fisheries and promote sustainable fisheries, whether it's formulating maximum sustainable yield escapement goals, or the vast amount of these stocks that we have escapement goals on, and we try to structure our fisheries so that we have [done this]" (Interview 01). A component of this system is the public process of management at the BOF, which many of the interviewees in all groups have participated in to some degree, through their ACs, developing BOF proposals, and commentary at BOF meetings.

Despite the opportunity for public engagement in formal institutions of management, the limitations of the BOF process were often discussed. An ADF&G staff person described the disconnect that can exist between the BOF and local decision-making by ADF&G, saying, "They say it's a large public process, but then when the public and Fish and Game agree on it, and the Board denies it, that kind of caught me off guard. How is this a large public process? Like this has been a huge heated issue for years and years and now we have public buy-in, we did the analytics on it, we're comfortable with it, let's provide some opportunity, let's create some new management tools…and it was still denied" (Interview 08). Even when there is agreement

between managers and fishermen at the local level, it is not necessarily formalized by the BOF. In this way, institutional capital of both fishermen and local managers is limited by this process.

4. *Interactions among social, financial, and institutional capital*

Social, financial, and institutional capital were all seen to be closely linked with one another in many instances. A strong capacity in any one of these was described as having a direct, positive influence on the others. Similarly, a limited capacity in any one of these was seen as having a negative effect on the others. As described by one commercial fisherman, "In all politics, it's the same thing. It's like, whoever has the most money and can buy the most time is going to get the best representation" (Interview 10). The best representation can then go on to advocate for increased allocation, or increased access to fishery resources, thus allowing the fishermen to make more money. Limited social capital between fishermen was also identified as inhibiting institutional capacity, as fishermen are less likely to come together and collectively advocate for their needs. Instead, when there are weak social connections among fishermen of the same fleet, there are scenarios where they may be advocating for different outcomes from management, rather than coming together as a united front.

Additionally, it was laid out clearly how increased financial capital can benefit social capital. One interview participant noted that they had heard stories about fishermen in higher earning fisheries taking BOF members out on multi-day hunting trips, adding, "It's going to help you… You're going to make some friends. They're going to have some sway in your direction, when that meeting comes up" (Interview 10). Higher financial capacity was described as allowing for an increase in social connections. This social capital, particularly between fishermen and managers, was then described as increasing institutional capacity, as fishermen were better able to successfully advocate for regulation changes that were in their favor. Conversely, lower

financial capital limited institutional capital in several ways; for example, less fishing-related income often required working an additional job, resulting in less time to engage in institutional processes such as BOF meetings.

Opportunities for building stewardship capacity

Interviewees identified a number of potential avenues for improving economic and environmental sustainability of their fisheries. These solutions were offered as a response to fishery stressors, as well as to strengthen financial, institutional, and social capital in Juneau small-boat fisheries. These are largely informed by individuals' specific backgrounds and beliefs, and, at times, solutions suggested by some individuals were contradicted by others.

One solution proposed by multiple fishermen was to reduce reliance on hatchery fish within salmon fisheries. Conversations around hatcheries often sparked strong opinions from individuals who explained that many in the industry had different viewpoints than theirs. Proponents of hatchery enhancement noted its importance in maintaining fishing opportunities for commercial and recreational fisheries. Others raised concerns about the potential adverse impacts of hatchery-produced salmon on wild-born fish and the intersection of hatcheries and political interests. One commercial fishermen proposed that "the solution is to get the sort of politics and the money and political interests who are lobbying for hatcheries out of the conversation, and just have an actual conversation about wild salmon and hatchery production interactions and what's really happening…reduce hatchery production, not eliminate, but like get back into balance with what's actually sustainable" (Interview 13). A common viewpoint expressed by fishermen we interviewed was concern about the impacts of current hatchery release numbers on natural-origin stocks.

Increased advocacy from gear group associations was brought up by several fishermen as a way to address multiple concerns, including providing an avenue to advocate specifically for equitable allocations. Gear group associations were viewed as ideally being a more accessible avenue for fishermen's needs or concerns to be more readily or easily communicated to management. Additionally, gear group associations serve as a pathway for fishermen to express concerns to management without needing specific social relationships in place, essentially bypassing some of the otherwise needed social capital. This was seen as being the ideal role of gear groups from fishermen, but several expressed that this was not the current reality.

Few concrete solutions were given to most environmental stressors listed by interview participants, but one that was brought up repeatedly by both fishermen and managers was improved tools for integrating climate change responses into management. These more nimble management tools would allow for more adaptive management to be made, which is seen as important because, as explained by an ADF&G manager, "a lot of our regulations have been in place since the '90s or early 2000s… and the fisheries have changed, climate has changed, the environment has changed...we always need to progress forward and adapt to what's changing, cause the environment's going to change no matter what we do, so we need to adjust policy to reflect that" (Interview 08). Integrating climate change responses into management was viewed as something for which there was an immediate need.

Making BOF meetings more accessible and the BOF process more trustworthy were discussed by many fishermen and managers as a way to more effectively translate the needs of fishing communities into policy. Several potential mechanisms for this goal were proposed, including ensuring that BOF members are from diverse backgrounds and experiences, making

meetings more financially accessible, depoliticizing the process, and ensuring BOF members have sufficient background knowledge of fisheries across the state.

Other less commonly proposed solutions included improved seafood marketing in order to stabilize price fluctuations year to year, increasing shoreside infrastructure to support fisheries, increasing diversity within the fishing industry (both of fishermen and management) in order to incorporate a wider range of viewpoints and experiences when dealing with current challenges, permit buyback programs to decrease fishing pressure, and increasing the presence of impartial observers on fishing boats.

Discussion

This work serves as a case study of an Alaska fishery social-ecological system viewed through the lens of local ecological stewardship. In Juneau-area fisheries, we see what stewardship looks like in a system facing a variety of environmental, economic, social, and institutional stressors. Low social, financial, and institutional capital within some sectors of the Juneau-area commercial fleet were seen as adding additional stressors, while simultaneously limiting the stewardship capacity of this system. Despite these challenges, fishery participants still engage in stewardship, including actions based around ecological conservation, knowledge production, engagement with management, and fishery advocacy. Finally, participants described a number of potential actions to address immediate challenges while also enhancing the stewardship capacity of the system. In addition, this case study highlights the work and knowledge that fishermen, fisheries professionals, and agency staff put into keeping these small boat commercial fisheries continuously viable.

A number of stewardship actions taken within these fisheries are influenced not by the incentive that they will receive direct benefits from these actions, or from a place of hope, but because there are few other options if they want to continue participating in their fishery. This was mainly true of political engagement, particularly surrounding BOF meetings and proposals. As one ADF&G staff person explained, at BOF meetings "you see people who come to the meeting and it's like, kind of life or death to them" (Interview 07), because their culture or livelihood could be drastically impacted at any moment. If they are not there to advocate for the allocation or regulations that would enable them to continue fishing, those might get taken away. The common conceptualization that "if you aren't at the table, you're on the menu," holds true in the context of fisheries management decisions here. If certain gear groups or sectors are not represented during BOF meetings, this could translate into reduced opportunity. As interviewees explained, allocative decisions that reduce harvest opportunity for a fleet can strongly impact the financial viability of staying in that fishery for its participants. Similar dynamics have been documented in small-scale fisheries globally (Jentoft and Chuenpagdee 2022) and in other contexts, such as international climate policy (Bamsey et al. 2015). If members of a group are not present during these political processes to advocate for their needs, they may end up in a worse position than they were previously.

These issues relate to what Clinch (2021) referred to as stewardship stemming from a "have to" standpoint, or what Stengers (2015) called "cold panic" guardianship (p. 32). In Clinch's 2021 study of environmental stewardship under an austere government in UK, residents living alongside a frequently flooding river took a wide variety of stewardship actions to help combat the detrimental social and environmental effects of flooding. However, these stewardship actions were taken due to a lack of government support or funding to mitigate these damages, so

there was a sense that "you 'have to' carry on and look after your environment even though there are no resources to support you" (2021, p. 252). Within Juneau fisheries, some participants described having to spend their time advocating for management decisions that will allow them to continue participating in their fishery, despite time and financial constraints that make access to meetings challenging. On one hand, the relatively high rates of political engagement described by interviewees could be interpreted as a signal that the current system is working as it should; on the other, understanding the extent to which participants feel no other option but to participate in political processes is critical for assessing whether additional support structures are needed to increase stewardship capacity as a whole. Barriers to engagement in the BOF process described by interviewees echo findings of Gordon et al. (2022) and Krupa et al. (2020), who noted that their study results indicated "the existence of serious barriers to diverse and inclusive public participation" (2020 p. 625). This is particularly clear when looking at the strong influence financial and social capital have on institutional capital. Fishermen from high earning fisheries and/or with political connections often have greater access to BOF members, which can confer additional benefits in the context of management decisions. Systemic concerns may not be visible when only considering stewardship actions on their own, and the greater socio-political landscape must also be taken into account.

Social capacity has been shown to directly influence stewardship capacity in other systems, similar to what we found for Juneau fisheries. For example, Turnbull et al. (2020) found that the size of a person's social network is a significant predictor of environmental stewardship actions at a coastal site in Australia. They found that having a large local social network was associated with being what they refer to as an "uber steward", or someone who takes a particularly high number of stewardship actions. Our results suggest that in Juneau, fishers

operate within small, fleet-based social networks that are not always tightly connected among fleets or sectors within the seafood industry. This contributes to lower overall stewardship capacity, not in terms of the frequency or extent of stewardship actions being taken, but by the effectiveness of these actions (e.g., lack of united voice with respect to some management decisions). Dissonance within social systems can directly work against individuals' and groups' abilities or choices to take stewardship actions. In a Nova Scotia fishing community, even though fishermen were facing a common set of problems, tensions among fishermen within the fleet continued to grow, as "differences in scale of fishing operation, fishing technology and geography split people apart" (Barnett and Eakin 2015 p. 111). In Juneau, fishermen acknowledged the strong tensions present among individuals or groups of fishers in the system. Social cohesion is particularly important for successful engagement with fisheries management (Pinkerton 1989; Pinkerton et al. 2014). The importance of social networks and cohesion may hold true even further afield than just social relationships of fishermen within the fleet, as the wider community of Juneau was not viewed as a "fishing community" by most interview participants. Participants conveyed community centered around fishing as "diluted" by tourism and government sectors, in part because of the lower relative economic reliance on commercial fishing compared to smaller, more rural communities in Southeast Alaska. Several interview participants pointed to limited infrastructure in place to support fishing. These factors, among others, contribute to a lack of strong social identity as a fishing community.

Adding to the complexity of understanding the role stewardship plays within Juneau-area commercial fisheries is the large reliance on hatchery-born salmon. A majority of fishermen we interviewed participated in the salmon drift gillnet fishery, which, with few exceptions, primarily targets hatchery-origin fish. Because of this, regardless of what conservation-based stewardship

actions are taken, these fish will continue to be produced and caught by fishermen. Therefore, stewardship in this fishery means engaging in a wider range of actions than only "fishing clean" and releasing bycatch. This may explain why many interviewees identified stewardship actions more broadly, such as actions to reduce carbon emissions, political advocacy to support fishing community viability, and knowledge exchange across institutions. In addition, different fishery participants had vastly different views of what stewardship looks like in a fishery largely reliant on hatchery fish (although the salmon fishermen we interviewed unanimously agreed on the importance of preserving wild stocks). Perspectives on hatcheries in Alaska range widely, with respect to both their benefits and costs (Harrison and Gould 2022). Similarly, while several fishermen expressed concerns that hatcheries are directly harmful to wild salmon stocks, other interviewees noted their importance in preserving wild stocks. An individual involved in salmon enhancement described the importance of hatcheries, saying, "We're [hatcheries are] here so that people can have a livelihood, and so that there can still be a sustainable protein in the world, and I think that part of the hatchery story is missed a lot of time, like thinking about the future of sustainable foods" (Interview 09). Salmon hatcheries have been seen to play important roles in local economies and community well-being in Alaska , while simultaneously raising major concerns for the impacts on wild stocks (Harrison and Gould 2022). As a result, what one person might view as stewardship (i.e., being part of the system that produces hatchery salmon), might directly contradict what another person views as crucial for this system to continue. Similarly, while some fishermen viewed stewardship as focusing their fishery on wild-born fish, other fishermen viewed stewardship as avoiding or releasing wild-born fish and instead catching mainly hatchery-origin fish. Understandings of how best to care for both the natural resource and the community are contradictory, and at times even contentious.

Conclusion

In viewing fisheries through the lens of local environmental stewardship, we highlight fishermen's knowledge and the important role they play in keeping fisheries continuously viable. Despite the many stressors Juneau fisheries are experiencing, people in the local fishing industry continue to put extensive time, effort, and care into these fisheries. Stewardship efforts are important to support, as they improve the adaptive capacity of the system, while simultaneously working towards more equitable and transparent governance (Mahon et al. 2008, Medeiros et al. 2014). Based on the interviews we conducted, we see many concrete ways stewardship can be supported by fishery management agencies, especially in terms of helping to increase knowledge exchange and interactions between fishermen and management. These include more informal, day-to-day opportunities for engagement (e.g., during license renewals and pre-season meetings), empowering fishermen to be more involved in data collection for the agency, and increasing opportunities for collaborative research. Importantly, each of these actions come directly from interview participants. While some require time, effort, and funding, most would not necessitate restructuring of the current management system. While there are still many broad-scale stressors that are difficult to address, these suggestions serve as actionable, community-centered efforts that would begin to address a variety of local concerns. Despite increasing stressors on fisheries across Alaska, there are still many concrete actions that can be taken to support fishing communities in Juneau and the broader Southeast Alaska region.

Acknowledgements

We would like to thank interview participants for the time, care, and knowledge they each shared with us. Thank you to Anne Beaudreau for the incredible support and mentorship

throughout this research, and thank you to Ellie Mason for support and teamwork throughout this process as well. We are grateful to Andrew Olson (ADF&G) for his contributions to project design and facilitating community connections. Max Worhatch (United Southeast Gillnetters Association) provided helpful insights into salmon gillnet fisheries. Thank you to Phil Levin (UW) for thoughtful and thorough reviews of this thesis. This research was funded by the North Pacific Marine Resources Term Fellowship, the Hewlett Endowed Fellowship, and the UW School of Marine and Environmental Affairs. This thesis will form the basis of a manuscript in preparation for journal submission: Scalisi E, Beaudreau AH, Mason E. Stewardship, advocacy, and knowledge in Juneau-area fisheries.

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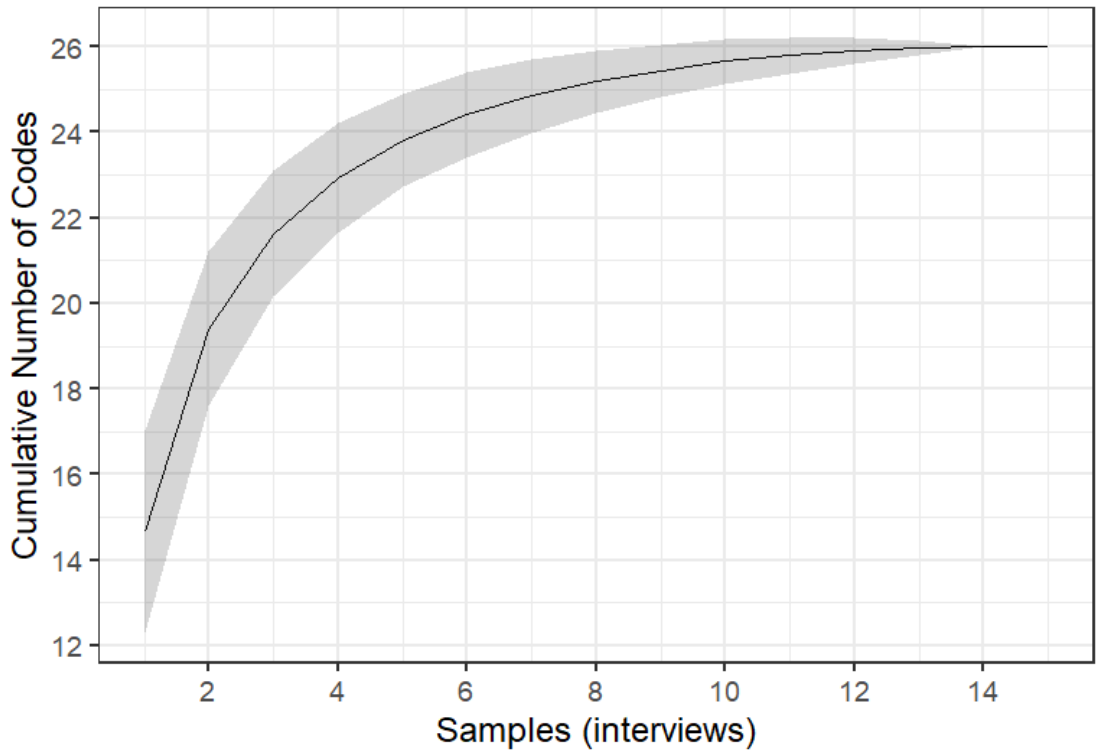

Figure 1. Cumulative code frequency plot showing the cumulative number of unique codes generated with each additional interview. Interview order was randomized and resampled to generate a smooth curve; the black line is the mean and gray shaded band is the 95% confidence interval of 1000 permutations. Code saturation is seen to occur around 10 interviews.

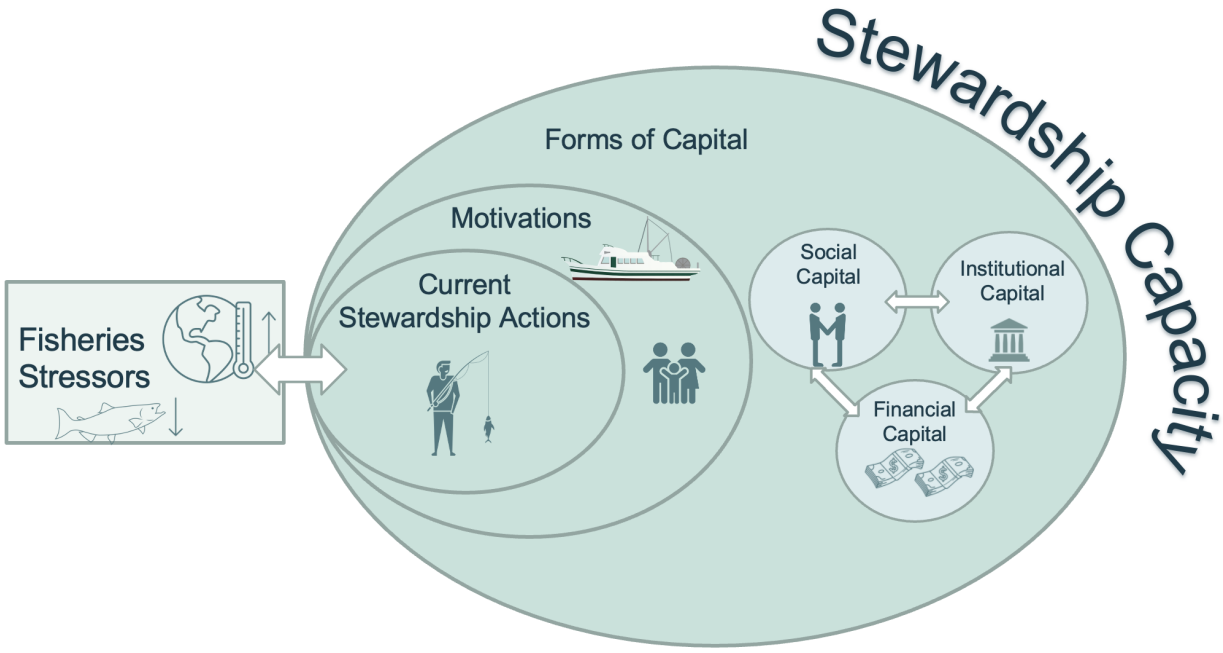

Figure 2. Social-ecological system of Juneau-area commercial fisheries, viewed through the lens of stewardship. Fisheries stressors directly impact various forms of capital within the fishery. These forms of capital, in combination with actors' motivations, together produce the stewardship capacity of the fishery.

Table 1. Coding scheme based on local ecological stewardship framework by Bennett et al. (2018).

Framework Component	Corresponding Codes	Code Description
Context	Fishery descriptions	Descriptions of Juneau fisheries, including historical anecdotes, specific gear descriptions, permit types, fishery regulations, and so forth
	Views of Juneau as a fishing community	Reflects different understandings of Juneau as a fishing community and the basis for that understanding
	Perspectives on hatcheries	Thoughts about hatchery benefits and impacts, and the overall role of hatcheries, that may conflict with each other. Focused on opinions or concerns regarding hatcheries, rather than descriptors (which would fall into a separate code)
	Fishery stressors	Stressors or concerns that apply to Juneau-area fisheries (may or may not be applicable to a broader range of fisheries also)
Actors	Fishers	General descriptors or characteristics of Juneau-area commercial fishermen. What "role" do they serve in the fishery? How are they described by themselves and by others? What responsibilities, rules, or relevant laws do they follow?
	Managers	General descriptors or characteristics of managers, specifically in Juneau. What

		"role" do they serve in the fishery? How are they described by themselves and by others? What responsibilities, rules, or relevant laws do they follow?
	Hatcheries	General descriptors or characteristics of hatcheries, with a focus on the local Juneau hatchery. What "role" do they serve in the fishery? How are they described by themselves and by others? What responsibilities, rules, or relevant laws do they follow?
	Processors	General descriptors or characteristics of seafood processors. What "role" do they serve in the fishery? How are they described by themselves and by others? What responsibilities, rules, or relevant laws do they follow?
	Fishing organizations	General descriptors or characteristics of fishing organizations, particularly those relevant to Juneau-area fisheries. What "role" do they serve in the fishery? How are they described by themselves and by others? What responsibilities, rules, or relevant laws do they follow?
Motivations	Extrinsic factors	Perceived direct benefits of stewardship actions; rewards or external benefits received from these actions
	Intrinsic factors	Moral/ethical reasons for taking stewardship actions

	Stewardship deterrents	Stated reasons for *not* engaging in stewardship actions of any form
Capacity	Financial	Financial resources available to individuals or collectives. Includes different financial/fishing decisions (direct marketing, multiple permits, etc.), as well as broad financial status of a fishing fleet
	Social	Relationships/interactions between fishermen and management *or* Existing relationships (or lack thereof) between fishermen in the area, as they relate to stewardship
	Physical	Technology and infrastructure that enable stewardship, including vessel size and power and shoreside facilities
	Cultural	Connections to place, tradition, and knowledge which contribute to stewardship
	Institutional	Includes what different actors are able to do through the currently established regulatory process and governance structures and how they allow for or influence stewardship
	Human	Individual and group attributes such as knowledge, past experience, and skill, as they enable stewardship actions
Actions	Conservation actions	Stewardship actions based around supporting the

		ecological system (i.e., working to lower bycatch, releasing fish of certain species or demographic traits)
	Knowledge production	Stewardship actions based around increasing knowledge within the fishery (typically related to fisheries sciences), often through collaboration with management
	Political engagement	Stewardship actions based around supporting the continued use of the resource (i.e., advocating for sufficient time/area, working in advocacy organizations in off-season)
Outcomes	Future goals/solutions	Hopeful or positive outlooks for the future of fisheries (either specifically, or broadly). Includes hopeful ecological, social, and policy components
	Future concerns	Concern, or negative outlooks, for the future of fisheries (either specifically, or broadly)

Table 2. Motivation types identified within Juneau-area commercial fisheries. Two types of motivation are referenced: intrinsic (relating to personal morals and beliefs) and extrinsic (relating to external rewards or benefits). Stewardship deterrents identify reasons participants described for not participating in stewardship actions.

Motivation Type	**Example Quote**
Intrinsic	"I've seen a much higher level of engagement with our lack of Chinook, I mean, Chinook salmon are the big charismatic species, and when you see those numbers dwindling you get people engaged and interested, just because it's near and dear to a lot of people's hearts for a lot of different reasons" (Interview 01) - Agency Staff
Extrinsic	"Most fisheries there's a natural incentive to fish clean, [to] get the target species. You don't kill a whole bunch of everything else. For a lot of reasons, right? It's a pain…it can wreck your gear, it's expensive, it slows you down." (Interview 03) - Juneau Commercial Fisherman
Deterrent	"That time [advocating at BOF meetings] would be better invested at this point in my life to taking care of me. Because…I don't think I'm going to have any impact." (interview 10) - Juneau Commercial Fisherman

Table 3. Forms of capital that enhance the capacity of individuals or groups to take stewardship actions within Juneau-area commercial fisheries. The forms of capital are ordered from the highest to lowest code frequency within interviews.

Form of capital (i.e., asset)	Definition (from Bennett et al. 2018)	Examples in Juneau-area fisheries	Exemplary quote
Social capital	Informal and formal relationships within fisheries systems	Relationships between fishermen, agency staff, and other actors within the same system	"People are doing everything they can to sway the Board [of Fisheries] members and it's not uncommon to see a Board member, and someone having dinner together, or out at a bar at night. Which is just how the process works." (Agency Staff, Interview 07)
Institutional capital	Inclusive of what each actor is able to do through currently established management processes and regulations	This includes fishers' ability to participate in Board of Fisheries (BOF) meetings, agency staff's ability to set time and area closures, and the mandate agency staff have to manage fisheries sustainably	"The Board tends to take comments from ACs very seriously, they give ACs a lot more time to talk at the board meetings, and comments coming from different gear group representatives and from these ACs oftentimes get a little more credence than from just random individuals." (Agency Staff, Interview 01)
Financial capital	Financial resources that are available to individual fishermen, the fleet, or management agencies	Money, permits, or gear contributing to financial wealth, which influence the ability to diversify fishing portfolios, the need to hold jobs	"I think that the wealthier fisheries definitely have better access to regulators, and that drives policy. And like, those of us who have had to take

		outside of the fishery, the ability to pay for advocacy needs such as lawyers	second jobs or whatever it is to make this thing go, don't have the extra time to organize, to develop the kind of financial war chest that you need to compete in that arena. And so I think a lot of times we've ended up at the bottom of the food chain on regulatory decisions." (Commercial Fisher, Interview 04)
Cultural capital	Processes maintaining connections to place, traditions, knowledge, and practices that are part of a group's identity, while also contributing to stewardship	Includes feelings that stewarding the ocean are an important component to being a fisherman, and knowledge allowing or informing stewardship decisions	"I think stewardship is a part of your identity, or it's a part of your personality, your culture, it's not something that you choose one day to have, and tomorrow, you don't have it… And so you practice stewardship every day, in some big macro, you know, event, or it's some small little micro decision that you have, you know, and then it's, it's there, and then it's gone." (Commercial Fisher, Interview 16)
Physical capital	Technology and infrastructure that enables stewardship actions	Boats that are set up to fish multiple species and permit types, different size gillnets to be more selective of target	"If you have a larger vessel like the crabbers do, a lot of times they'll be longliners, they'll be crabbing, they'll do Dungy crab, they'll

		species, dockside infrastructure	probably do salmon gillnetting or herring for instance…But more entry level stuff… Dungy crab, you can get a 75 pot permit for that one, and have a relatively small vessel. You can do trolling on a smaller vessel, or even on a salmon gillnetter. So it all depends on the size of the vessel." (Agency Staff, Interview 08)

Appendix A: Interview Guide

This interview protocol is a guide for the interviewer, who will conduct verbal, in-person interviews with participants in a semi-structured format. Participants will not have to provide written answers to questions.

Reminders for interviewer: Summarize the consent form for them and allow time to look it over (includes project overview, confidentiality information, and tells them about how long the interview should take). Allow time for questions. Ask them for oral consent. Ask for consent to audio record. If yes, start audio recorder and state date and interview #.

Part 1. Background and experience

We're interested in your experience with commercial fisheries mainly based around Juneau (but interested in hearing your experiences from any other regions you've fished, as well). [Ask about all relevant experience. Ask about years in each fishery, regions, seasons, gear types, and target species (and bycatch if relevant).]

a. Commercial fishing

b. Research and/or management

c. Other (please specify)

Part 2. Changing fisheries

1. What are some of the biggest challenges your fishery is facing right now?
   [*If participant is a researcher/manager, ask: What are some of the biggest challenges the fisheries you work with are facing right now?*]

2. Do you have any concerns about your ability to participate in the fishery long term? If so, what are they?
   [*If participant is a researcher/manager, ask: Do fishers express concerns about their ability to participate in their fisheries long-term? If so, what are they?*]

3. [*If specific concerns identified*] What can be done to address these issues?

Part 3. Stewardship and management

Questions for fishers

1. Do you have any fishing practices (or rules on your boat) that help provide stewardship or conservation of the resource? [Follow up questions: How did you decide to do this? How have these practices changed or evolved over your time as a commercial fisher?]

2. Do you share these actions with other fishers, or encourage others to do the same? Have other fishers ever encouraged you to take any stewardship-related actions on your boat?

3. Are your views on stewardship/conservation something that you would talk about with other fishers? Are these views something you generally agree with other fishers on?

4. Do you ever informally (not through a documented proposal or public commentary) share these actions with ADF&G staff?

5. What are the benefits of communicating with agency staff? What are the costs?

6. What should ADF&G do to most effectively include fishers' and community members' ideas and concerns in fisheries management?

Questions for agency staff

1. In what capacity do you play a role in engaging stakeholders within your agency/organization/institution?

2. What is most often the context or reason for having informal conversations with commercial fishers? Is this a large part of your job?

3. When having (informal) conversations with commercial fishers, what concerns are most often brought up?

4. If yes, do these conversations ever influence management decisions or practices?

5. Do fishers ever share their own stewardship actions or ideas with you?

6. What might motivate or discourage a fisher from sharing these practices with you?

Part 4. Demographic information

Interviewee may write responses to this section if they wish.

1. In what city or town do you live?

2. What year were you born?

3. What is your gender?

4. What is your race, ethnicity, or cultural background? Mark one or more boxes.
   □ American Indian or Alaska Native – Name of principal tribe:
   □ Asian
   □ Black or African American
   □ Hispanic or Latino
   □ Native Hawaiian or other Pacific Islander
   □ White
   □ Other, please specify:
   □ Do not wish to provide