Fishing Community Resilience, Social Cohesion and Offshore Wind Energy Development in California

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Executive Summary

Since 2016, the State of California has worked with federal agencies and Tribal governments to pursue offshore wind energy (OSW) development as part of its plan to achieve 100% "clean" energy by 2045. In 2022, the US Bureau of Ocean Energy Management auctioned five OSW lease sites in federal waters: three in the Morro Bay Wind Energy Area off San Luis Obispo County and two in the Humboldt Wind Energy Area off Humboldt County. Although the Trump administration has called for a temporary cessation of federal OSW leasing and permitting, California continues to pursue OSW development in both federal (3-200 nm) and state waters (0-3 nm).

As part of the State's renewable energy development process, the California Coastal Commission (CCC) has convened the California Offshore Wind Energy Fisheries Working Group ("7C Working Group"), comprised of agency, OSW industry, Tribal and fishing community representatives to address concerns about adverse impacts of OSW on California fisheries in a way "that prioritizes fisheries productivity, viability, and long-term resilience" (CCC 2022a). Toward these ends, the Working Group is developing a plan for a Fisheries and OSW Resiliency Fund – a type of "community benefits agreement" whereby a developer commits to providing financial and/or other types of benefits to an affected community.

This paper draws on grey and refereed literature to examine the capacities and mechanisms for supporting fishing community resilience with particular attention to social cohesion, the "glue" that holds fishing communities together as they plan and make decisions to cope and adapt to change. It then provides recommendations for how such a resiliency fund could be used to maintain and enhance the resilience of California's fishing communities going forward.

Fishing community resilience, social cohesion and offshore wind energy

Fishing community resilience is the ability of communities – people connected socially, culturally and/or economically to fisheries and seafood production – to draw on their individual and collective capacities or 'capitals' to cope, adapt and/or transform in anticipation of and response to shocks and stressors. Social cohesion serves as a foundation for the development, maintenance and use of those capitals.

The diversity within and across place-based and interest-based communities is a source of both resilience and tension. Investment in individual people, operations, and infrastructure to mitigate adverse impacts such as lost gear or access to fishing grounds and lend resilience are important; however they do not ensure that the community's collective needs are met. Investment in social as well as economic capital is essential in its own right and as a necessary complement to individual support.

Fishing communities in California, as elsewhere, have drawn on diverse capacities to demonstrate resilience to myriad environmental, regulatory, social and economic challenges and impacts. Historically and increasingly, these capacities have existed and been activated by interdependent groups of people, social structures and institutions within and, often, beyond the fishing community. Among many

examples, entities such as the Joint Oil/Fisheries Committee and Liaison Office (JOFLO) and the Central California Joint Cable/Fisheries Liaison Committee have operated over decades, with continuous funding from the energy and cable industries, respectively. Throughout, these efforts have variously facilitated communication, avoided and resolved space-use conflict, sponsored research, and supported efforts to maintain and enhance fishing community social cohesion and wellbeing.

OSW poses additional challenges alone and in combination with other stressors on fisheries and fishing communities throughout the OSW lifecycle in four interdependent contexts. Displacement of fishery participants, activities and fishing communities ***at sea*** at lease sites where turbines largely exclude other uses along with temporal and spatial disruption of fishing activity between those sites and ports for OSW service activities. Similarly, disruption and displacement ***shoreside*** at the working waterfront exacerbates ongoing challenges related to access, infrastructure and goods and services necessary for safe and effective fisheries and seafood production. These OSW-induced impacts, in turn, have implications for the ***seafood supply system***, which relies on established spatial and temporal patterns of fishing, landing, handling and distribution to meet demand and maintain access to those markets. OSW also adds complexity to ***fishery and broader ocean and coastal governance*** in existing and new arenas where fishing community participation is needed to inform policy deliberations and decision-making.

Northern and central California fishing communities led projects in 2021 and 2022 to map their fishing grounds and related information to better inform OSW decision-making processes. Beyond those efforts, the California Fishermen's Resiliency Association, the Alliance of Communities for Sustainable Fisheries and their member organizations have collaborated on efforts to address adverse impacts of OSW on at-sea and working waterfront communities, with funding from cable-liaison committees and other local, regional and state entities. Altogether, these and other efforts represent and have built community capitals, founded on and contributing to social cohesion within and across the interconnected contexts where fishing communities operate. They can be leveraged and built upon to advance fishing community resilience in the context of OSW development.

Recommendations

The following recommendations suggest ways that a fisheries resiliency fund could be used to strengthen social cohesion, adaptive capacity and community resilience for California's fishing communities:

Community-centered visioning and planning processes to collectively and iteratively identify and prioritize current and future needs, opportunities, and challenges are essential for maintaining and building social cohesion, adaptive capacity and resilience. Community members share their knowledge, experience, values and ideas, assess capacities, and determine how best to use them. This can be challenging especially given the diversity of contexts, individual and community identities, and individuals' and groups' at-times conflicting priorities. Nonetheless, such collaborative strategies have been developed and used effectively within and beyond California. Recognizing and investing in efforts and organizations that are best suited to and trusted by community members for such efforts is key.

Physical and social infrastructure – designated places, facilities and coordinated efforts that bring community members together – can increase social cohesion and community wellbeing. Examples include community cold storage, seafood handling and marketing facilities, and their shared use, which serve practical needs and create spaces for building community capitals and social cohesion among fishery participants and with seafood consumers.

Training and support for meaningful participation in decision-making processes for those new to or already engaged in fishing, seafood handling and fishery-support activities strengthen individual and community resilience. Apprenticeship and other training programs in California and elsewhere provide intensive training on various aspects of running a fishing business, fishery science and management. They help to counter the "graying of the fleet" by passing on critical knowledge and skills and strengthening community capitals and social cohesion. Sustained investment in such capacity-building programs helps address inequities in social and political capital, helping enable meaningful engagement in fisheries and management and better-informed governance.

Cooperative arrangements to facilitate communication and collaboration such as JOFLO are useful for coordinating space use, minimizing conflict, and enhancing safety and effectiveness of operations at sea and shoreside. Participating in and sustaining such arrangements requires considerable individual and community time and resources. Providing funding for support staff and consistent engagement by fishing community members enables participants to share and build knowledge, expertise and trust to address problems and opportunities throughout the OSW lifecycle.

Representing and celebrating fishing heritage and culture via fishing community-led or co-led efforts to document and share "social memory" helps develop and reinforce community capitals and social cohesion. Social memory also is central to community-centered visioning and planning. Community-led public education and outreach at museums, aquariums and science centers as well as local seafood marketing efforts at the working waterfront bring heritage and culture to the larger community. Investing in such efforts fosters and strengthens connections between the fishing community and the larger coastal community and region.

Conclusion

California fishing communities possess and have access to community capitals that provide a foundation to build and enhance fishing community resilience. While these capitals are considerable, they are strained by the increasing and complex demands of the diverse contexts that fishery participants and communities must navigate. Sustained OSW developer investment in the fishing community-centered mechanisms identified in this paper can both leverage and strengthen social cohesion, adaptive capacities and thus forward-looking community resilience in response to change.

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Introduction

In recent years, growing interest in offshore wind energy (OSW) to meet increasing energy demands while reducing reliance on fossil fuels has led to federal and state initiatives for its development. At the direction of the recent Biden administration (Executive Order 14008), the federal Bureau of Ocean Energy Management (BOEM) accelerated OSW development, including through the auctioning of OSW lease sites off two areas of California: the Morro Bay Wind Energy Area (MBWEA) off San Luis Obispo County and the Humboldt Wind Energy Area (HWEA) off Humboldt County. BOEM's offering of these leases coincided with the State of California's commitment to develop OSW as part of its larger energy transition plan. Although the Trump administration issued an Executive Action on January 20, 2025 to temporarily cease federal OSW leasing and permitting processes (Executive Office of the President 2025), California continues to pursue OSW development both offshore (3-200 nm) and in coastal waters (0-3 nm).

As offshore wind energy development (OSW) proceeds in California, the state's Coastal Commission has convened the California Offshore Wind Energy Fisheries Working Group (known as the "7C Working Group") to develop a set of tools as part of a statewide strategy to address fishing community concerns about the potential impacts and implications of OSW.[1] The Working Group, made up of agency, OSW industry, and fishing community representatives, is engaged in discussions about how to avoid, minimize and mitigate adverse impacts on California fishing and fisheries in a way "that prioritizes fisheries productivity, viability, and long-term resilience" (California Coastal Commission 2022a). As part of this process, a subgroup of the Working Group is developing a plan for a Fisheries and OSW Resiliency Fund to help mitigate adverse impacts on the fishing community.[2] For fishery participants and fishing communities faced with losses of fishing opportunity, a resiliency fund can both mitigate for loss and support resilience by reimbursing fishermen for lost gear and providing individual, one-time payments for documented losses of access to fishing grounds to "keep fishermen fishing." An enduring resiliency fund may also be used to support fishing community resilience via economic investments (e.g., agricultural price supports). This paper examines the capacities and

[1] SB 286 (2023, McGuire).

[2] A resiliency fund is a form of a community benefit agreement (CBA) between a project developer and an affected community that provides a range of benefits, including financial incentives, infrastructure, and community empowerment measures (Glasson 2017).

mechanisms for supporting resilience with particular attention to social cohesion, the vital "glue" that holds fishing communities together as they plan and make decisions to cope and adapt to change.

In the following, we identify and explain the relevance of key concepts and considerations related to fishing community resilience and OSW, with application to the California fisheries context. We describe the multiple, interdependent contexts OSW interacts with and affects fisheries and fishing communities. We then provide examples of California fishing community-led and co-led efforts that demonstrate social cohesion, adaptive capacity and resilience to change. As OSW poses new challenges for fisheries and fishing communities, with direct, indirect and cumulative impacts and implications, we offer recommendations for how a resiliency fund could be used to maintain and enhance the resilience of California's fishing communities going forward.

Fishing Community Resilience

Fishing communities[3] are groups of people connected to a geographic location and/or by their shared interest in fishing and associated seafood production (Brookfield et al. 2005, Hogan et al. 2023). St. Martin and Hall-Arber (2008a) focus on fishing communities at sea - spaces and places at sea characterized by shared ecological knowledge, history and culture, common fishing grounds and practices, and co-produced adaptations and innovations - and the relationships and interdependencies between them and shoreside places and groups of people. (See also St. Martin and Olson 2017.) Shoreside place-based fishing communities typically are located at ports and harbors where fishing operations are based and/or land their catch, and include the people, organizations and businesses that provide infrastructure, goods and services that support fishery activities, often serving other users and community members as well (Pomeroy et al. 2018). The seafood supply system includes fishermen, seafood handlers, vendors and consumers, the relationships among them, the products produced and how they move from producer to consumer (Figure 1); altogether, these constitute the fisheries social system that enables fisheries productivity, viability and resilience (Pomeroy et al. 2018) (Figure 2). Both the characteristics and capacities of people and the nature and structure of their relationships comprise such communities and systems.

[3] Community, more generally, is defined as "a group of people living in the same place or having a particular characteristic in common" or "a feeling of fellowship with others, as a result of sharing common attitudes, interests, and goals" (Oxford English Dictionary 2024). The Sustainable Fisheries Act (1996, PL 104-297) defines a fishing community as "a community which is substantially dependent on or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, and crew and United States fish processors that are based in such community." However, this definition does not account for the spatial complexity of fisheries and associated political, social and economic relationships, among other things. (See, e.g., Clay and Olson 2008.)

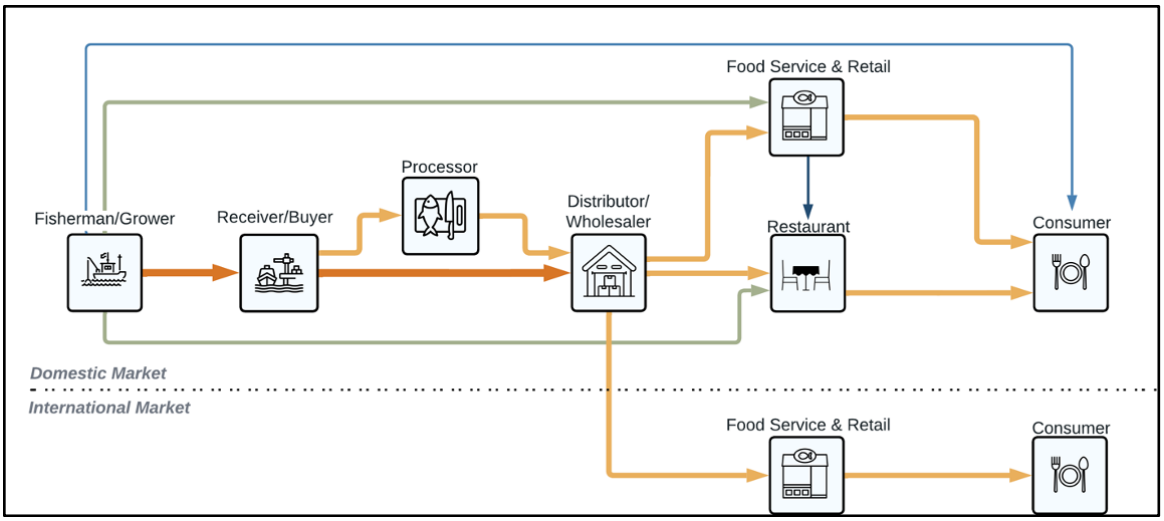

Figure 1. Seafood supply pathways (adapted from McVeigh et al. 2023).

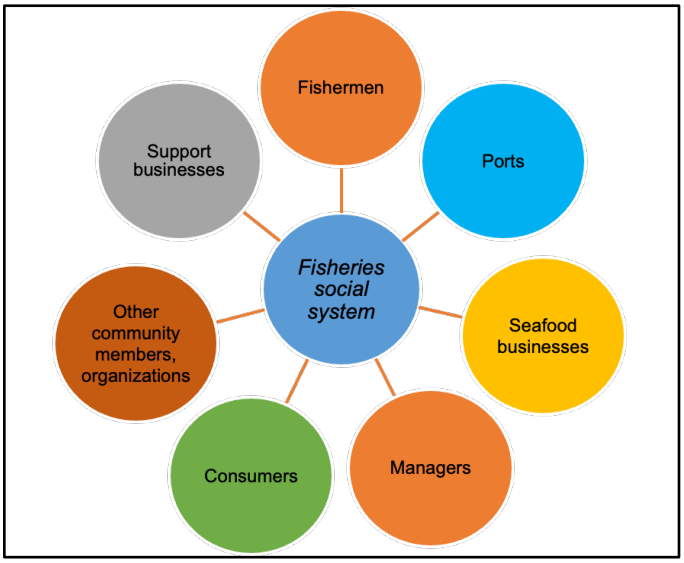

Figure 2: Fisheries social systems (adapted from Pomeroy et al. 2018).

Within and across fishing communities, individuals and groups have developed social identities and attachments to places shoreside (Khakzad and Griffith 2016) and at sea. These connections to particular physical and social settings where activities and social interactions occur are linked to different types of social and psychological benefits, including a stronger sense of identity with one's communities (Brown et al. 2003, Stedman 2003). Preserving these social identities and attachments supports fishing communities' cultural heritage, way of life, and sociocultural wellbeing. (Khakzad and Griffith 2016).

In the California context, fishing communities of place include, for example, the Eureka, Morro Bay and, more expansively, the Monterey Bay fishing community. The California Dungeness crab fishery and the wetfish fishery, comprised of fishermen, handlers, ports and fishery-support businesses, are examples of communities of interest. Examples of California's (and the West Coast region's) fishing communities at sea include albacore and salmon fishermen, known for working as "code groups" that facilitate communication and cooperation at sea. Most recently, fishermen and others have come together to create new communities locally, across much of the state and along the West Coast, in support of their common interests, concerns and needs associated with OSW.

Community resilience is defined by Magis (2010) as the "existence, development, and engagement of community resources by community members to thrive in an environment characterized by change, uncertainty, unpredictability and surprise." Community resilience also is "the ability to withstand shocks and stresses without upheaval" (White 2015). These shocks and stresses may be natural, anthropogenic or both and can be amplified – or in some cases buffered – by one another. Their impacts are cumulative, including individual impacts and the interactions among them.

Community resilience reflects the capacity of social groups not only to bounce back from disaster, but also to adapt to or anticipate change (Wright 2016). Community resilience hinges on access, activation and use of social, political, financial and human capacities (or 'capitals') to solve problems, address challenges, and take advantage of opportunities (Schobert et al. 2023). Individuals may possess some of these capacities, but their utility and effectiveness depend on individuals' relationships with one another, i.e., community (Roberston et al. 2021). Magis (2010) refers to this as 'community capital' – the degree to which a community can collectively develop and engage resources to improve well-being. As Ryan et al. (2018) note, community resilience "is not simply a collection of resilient individuals," but instead encompasses a more complex set of cross-cutting relations within and across communities and scales, from local to national to global.

Community capital, in turn, is connected to social cohesion, which is defined as the strength of relationships and sense of solidarity among members of a community (Gómez-Andújar et al. 2022). Social cohesion is largely viewed as the "glue that holds communities together" (Gray Group International n.d.). Social cohesion fosters a sense of belonging, enhances trust in others, and promotes inclusion. It encourages participation in community activities and civic life, a sense of legitimacy and confidence in institutions, and appreciation and respect for differences. Each of these components is central to community capital (Spoonley et al. 2005).

Social cohesion also is based on accumulated social capital. Social capital includes norms that facilitate trust, reciprocity, and the exchange of information, knowledge and resources in a community (Dacks et al. 2020). Such social capitals are directly tied to community resilience. Liu et al. (2022) identify community trust as a key component of social capital that flows through social networks to support community resilience, noting that "enhancing trust and connectivity

can influence resilience." And whereas social capital tends to have an individual focus, albeit with the quality and nature of social interactions influenced by the wider social setting, social cohesion typically operates at the group or societal level (Claridge 2020). As social cohesion operates on the larger societal level, social structures and institutions – the networks of relationships, norms (informal, mostly unwritten, rules that shape how people interact – play a crucial role in fostering social cohesion, especially a sense of belonging and unity (Ostrom 1990, Isham 2000).

Social cohesion can be an asset when used as a basis for coming together toward common, positive goals and outcomes (Albert 2024, Gómez-Andújar et al. 2022). However, social cohesion can be difficult to achieve and can be a liability when used as a basis for excluding others, avoiding difficult choices, ignoring relevant – and valuable – information (Albert 2024, Gómez-Andújar et al. 2022). Social cohesion, as an asset, is distinct from social conformity, where individuals adjust their behavior, opinions and attitudes to align with those prevailing among the majority, even in cases where they hold dissenting views (Asch 1956). Such social conformity limits the availability of and access to adaptive capacities. Dissenting views create social tension which in the extreme can disrupt social cohesion but also serve as a source of useful information and insight.

Building Fishing Community Resilience

Maintaining and building social cohesion, community capitals (capacities) and, ultimately, the resilience of fishing communities is a process rather than an outcome (Roberston et al. 2021, Boston et al. 2024). It requires ongoing, coordinated attention to multiple dimensions and is a long-term learning process that involves diverse parties interacting over time (Comfort 2016). Roberston et al. (2021) identify seven key themes or features that make a community resilient: social ties and connections; experience and shared memory; leadership, engagement and shared responsibility; mind-set, collective thinking, openness to adaptation and cultural change; integration, inclusivity, equity and diversity; communications, social support and coordination; and training and exercises to identify and act on local needs. (See also Johnson et al. 2014.)

California Fishing Community Resilience and Offshore Wind Energy: Key Contexts

California's fishing communities, variously defined, face individual and cumulative challenges requiring resilience to past, current and future shocks or stressors within and across four dynamic, changing and interdependent contexts: at sea; shoreside along the working waterfront and associated coastal communities; throughout the seafood supply system; and in fishery and broader ocean governance systems. OSW is a significant stressor in each of these contexts (California Coastal Commission 2022a, 2022b).

At sea: Climate change is affecting abundance and distribution of species, habitats and ecosystems, requiring fishermen to "follow the fish" while also avoiding protected species (Free et al. 2019, Dudley et al. 2021). These individual and collective adjustments and sometimes fundamental shifts in where, when and how fishing occurs require the use of

existing capacities and the development of new ones. Such adjustments are made in the context of historic and ongoing marine space use coordination within and among fishing communities at sea and with other ocean users (Industrial Economics Inc. 2012), as with the West Coast Crabber-Towboat Lane Agreement.

Expanded and new uses of marine space and the ocean environment including recreation and tourism, subsea cables, maritime commerce, offshore oil and gas production and decommissioning, and mariculture as well as planned OSW development affect fishery access and dynamics, often resulting in displacement and disruption of fishing communities at sea. Moreover, OSW – like offshore oil and gas, subsea cable, and (typically) mariculture operations – is fixed in place and precludes or significantly constrains fishing and other spatially variable and mobile activities (Pomeroy et al. 2015). According to the California Coastal Commission, lease sites within both the HWEA and MBWEA overlap with fishing grounds for several important fisheries (California Coastal Commission 2022a, 2022b). Disruption and displacement due to OSW activities increases costs and time at sea to reach new fishing grounds, with implications for safety as well. OSW-induced changes in fishing activities at sea, in turn, affect shoreside communities and reverberate throughout the seafood supply and management systems (Pomeroy et al. 2015, Hoegh-Guldberg et al. 2023; see also Ounanian and Howells 2024).

In addition, increased OSW-related vessel traffic within and among ports, navigation corridors and lease sites poses further challenges (Vanderheiden 2022). At Eureka, for example, crossing the bar to enter Humboldt Bay and access the harbor can be extremely dangerous and must be timed to ensure safety (NOAA 2025, Pomeroy et al 2010). This hazard is amplified if and when fishing vessels are required to delay crossing the bar to accommodate OSW operations, especially those associated with transporting turbines to and from lease sites.

Shoreside: Safe, effective and productive fisheries depend on access to ports and harbors, the working waterfront where the catch is handled, and necessary infrastructure, goods and services (Pomeroy et al. 2018). These sites are key points of contact between communities at sea and communities on land, connecting the ocean natural resource system and the shoreside food system (Olson et al. 2014) and, in turn, larger coastal communities, regions and beyond. Gentrification; expanded and new uses of the working waterfront; and deterioration, reduced access and loss of infrastructure, goods and services all pose challenges to California's fishing and working waterfront communities (e.g., Culver et al. 2007, Pomeroy et al. 2010, Richmond and Casali 2022, Lisa Wise Consulting 2012, 2014, 2018).

Planning for OSW at ports and harbors near OSW lease sites affords opportunities for addressing critical, long-standing needs for repair, maintenance and replacement of shoreside infrastructure, goods and services. However, OSW-driven changes to the working waterfront, especially where fisheries and seafood handling have a long history, are likely to result in displacement, reduced access and downsizing of the shoreside fishery-support

system (California Coastal Commission 2022b, Hogan et al. 2023, Scheiblauer 2023; see also Smythe et al. 2025). The Port of Humboldt and the Port of Long Beach have been selected as assembly and staging sites for the HWEA and MBWEA sites, respectively. For the HWEA, the Port is focused on redeveloping a former pulp mill site for assembly, staging and service operations, and including an area used for seafood handling and gear storage by some fishery participants recently displaced from other, more centrally located sites. OSW-related development at the Port of Long Beach will add to the port's established sizable maritime industry and commerce. With the considerable distance of the Port of Long Beach from the MBWEA, the harbor commission for the small coastal community of Port San Luis voted in August 2024 to move forward with a study to evaluate the site's potential to OSW operations and maintenance (Herrera 2024). OSW development and operations at these sites will significantly change the social and cultural, as well as the economic, character of the fishing and host communities.

The seafood supply system: The marine species landed by commercial fishery participants at California ports are handled and sold via diverse seafood pathways that range from direct-to-consumer off-the-boat or dockside sales by fishermen to multi-step, long-supply chain sales domestically and internationally via wholesalers and retailers (Pomeroy et al. 2016). The structure, function and viability of the seafood supply system and these various pathways are sensitive to local, regional and global environmental and socioeconomic conditions. In recent years, expanded global markets for live and fresh seafood, seafood trade tariffs, and the COVID-19 pandemic as well as more localized environmental and regulatory events such as consolidation, down-sizing and loss of seafood handling businesses, and growth in more direct seafood sales have required fishing community adaptation (Culver et al. 2023, Wilcox 2020, Advani et al. 2024).

OSW's implications for the seafood supply system follow from expected disruption and displacement of fishing activity at sea and of shoreside capacity to unload, handle, process and sell the catch. Delays resulting from changes to navigation to avoid OSW sites, service vessel traffic and port congestion can affect seafood quality. Changes in where fishing occurs can lead to changes in when and where the catch is landed, affecting established social and economic networks for handling seafood (Pomeroy 2002). Similarly, changes in the availability of and access to fishery-support infrastructure, goods and services, can disrupt seafood handling, sales to local customers (e.g., off-the-boat or dockside sales) and transport of product to wider markets.

Fishery and broader ocean and coastal governance: Fishery participants and communities interact with, influence, and are affected by state and federal fishery management, which govern where, when and how fishing and landing the catch are done. Fishery management has become increasingly complex in response to changing environmental, socioeconomic and broader socio-political conditions. In addition, the proliferation of ocean activities, interests and interactions has led to the expansion of marine spatial planning and other ocean management efforts. Altogether, these pose challenges for fishing communities and their members including reduced access to and allocation of fishing opportunities;

increased costs of entry and participation; stagnant/declining income-generating opportunities; and increasing needs for data, information and knowledge to inform "good-fitting" management measures. Similar considerations pertain to coastal governance, where increasing demand for working waterfront space and facilities plays out across local, state and federal levels. The complexity of ocean and coastal governance provides myriad opportunities - and imperatives - to participate in management processes by serving on advisory panels, working groups and the like, well beyond providing public comment.

OSW substantially adds to the complexity and imperatives for fishing community participation in ocean and coastal governance. Relevant decision-making and implementation processes are lengthy and often fast-paced, highly structured and involve myriad actors from local, federal, state and Tribal government, multiple industries and coastal communities.

Within and across these contexts, OSW development disrupts fisheries, fishing communities and the contexts in which they operate, and requires activation of adaptive capacities for fishing community resilience. Moreover, fishing community resilience is influenced not only by processes at the community level, "but also by actions at lower levels of organization (individuals, households), and by drivers of change originating at higher levels (national level policies, globalized market forces)" (Berkes and Ross 2016) (Figure 3).

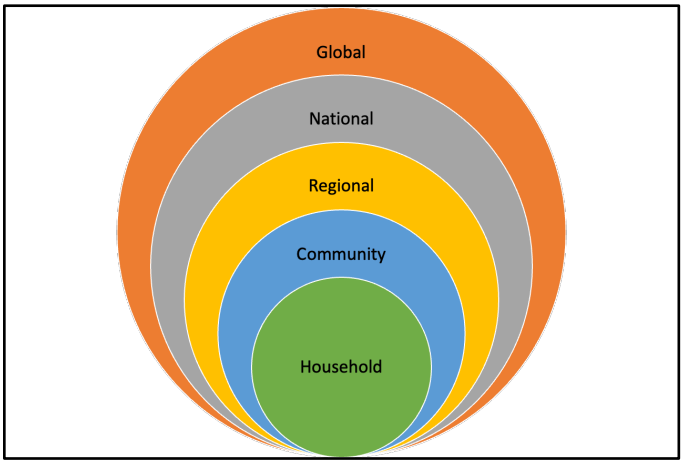

Figure 3. Processes at all levels of organization affect and are affected by those at the community level and community resilience (adapted from Berkes and Ross 2016).

California Fishing Communities: Social Cohesion, Adaptive Capacity and Resilience

In each of the California fisheries contexts, individually and cumulatively, the fishing community has demonstrated resilience, drawing on individual and collective capacities to adapt to diverse challenges of fishery disasters, COVID-19 seafood demand and supply disruptions, and management measures to reduce risk of interactions with protected marine species. Many California ports have long had non-profit, port-based fishing associations, many of which also are members of umbrella organizations such as the Pacific Coast Federation of Fishermen's Associations. Fishermen and buyers have collaborated to establish non-profit fishery-based organizations such as the California Coast Crab Association and, pursuant to the 1937 California Marketing Act, marketing boards such as the California Salmon Council and the California Sea Urchin Commission.

Historically and increasingly, these capacities to cope, adapt and transform have existed and been activated by interdependent groups of people, social structures and institutions within and, often, beyond the fishing community in California (Aguilera et al. 2018, Selden et al. 2024, Waite et al. 2024). Further, efforts to develop new capacities have taken place in relevant fishery contexts. The following are examples of efforts that demonstrate and support fishing community resilience in California that are particularly relevant in the context of OSW.

The Joint Oil/Fisheries Committee and Liaison Office were established in 1983 by the offshore oil and fishing industries in south-central California in response to space-use conflicts between them (Knaster et al. 1998). The Joint Committee designed and has since overseen the operations of the Liaison Office which facilitates inter-industry communication, keeps records of conflicts and their resolution, and provides other services to the industries as directed by the Joint Committee. Similarly, cable/fisheries liaison committees established along the West Coast in the late 1990s facilitate communication, coordination and cooperation between the undersea fiber optic telecommunications cable and commercial fishing industries. As one example, the Central California Joint Cable/Fisheries Liaison Committee (CCJC/FLC), among others, administers the cable industry-funded Commercial Fishing Industry Improvement Fund, which provides grants to support efforts to enhance and assist commercial fishing industry cohesion and wellbeing in San Luis Obispo County. Both JOFLO and the cable/fisheries liaison committees have operated over decades, from siting and development through operation and decommissioning, with continuous funding from the energy and cable industries, respectively.

The Alliance of Communities for Sustainable Fisheries, a non-profit organization established in 2001 to advocate for the heritage and economic value of fishing to the state's coastal communities, is another example of concerted efforts supporting fishing community resilience. The Alliance includes representatives of Central Coast commercial fishing associations, port/harbor managers and other fishing industry and recreational fishing organizations that have a strong presence in the region (ACSF n.d.). Funded primarily by the CCJC/FLC, the Alliance connects fishermen with their communities, represents fishing interests in state and federal

processes and has secured funding to support work including scientific peer reviews, public opinion polls, and fishing community sustainability plan development to inform those efforts.[4]

Following the 2011 implementation of the individual transferable quota system in the West Coast groundfish fishery, groundfish fishing community members and partners in several California port areas established non-profit "community quota funds" to hold and manage quota and maintain the local groundfish fishery system. The Monterey Bay Fisheries Trust (MBFT), for example, was established in 2014 by fishing community leaders, the City of Monterey, the Monterey Bay Aquarium, The Nature Conservancy and others to acquire and retain quota toward preserving the economic viability and culture of Monterey Bay's fishing communities. Initially funded by the Environmental Defense Fund's California Fisheries Fund followed by donations and grants from individuals and organizations, the MBFT has expanded its scope, building partnerships with a diversity of community members and organizations as it seeks to "ensure sustainable fisheries, resilient communities and a healthy ocean for years to come" (MBFT n.d.). With a Board of Directors from related fields (e.g., harbor management, business, fisheries science and marine conservation) and 12 fishing community Advisors, the MBFT has used and amplified its diverse community capitals via a suite of projects that seek to increase access, availability and demand for local, sustainable seafood; and provide support services and leadership training to help fishery participants adapt to changing seafood supply systems and ocean governance.

Richmond and Casali (2022) highlight the role of social capital in helping the Shelter Cove, California fishing community recover from severe decline experienced from the mid 1980s through the early 2000s due to environmental and regulatory change. They and others collaborated with the community to assess needs and develop a fishing community sustainability plan (Lisa Wise Consulting 2018b). They attribute the community's resilience to its activation of adaptive capacity in response to the threat of losing its launch facility. This response included building bridging relationships (social capital) with academic institutions and government, engaging in strategic planning to identify opportunities and constraints, securing funding and its leadership and control of revitalization efforts.

Another instance of California fishing communities' adaptive capacity and resilience is the Noyo Ocean Collective (NOC), founded by the City of Fort Bragg, Noyo Harbor District, the Noyo Center for Marine Science, Mendocino College, the Sherwood Valley Band of Pomo Indians and West Business Development Center, in response to climate change stressors, demographic shifts and the COVID-19 pandemic. The NOC has received funding from state and federal agencies along with local and regional non-profit organizations and businesses. Central to the NOC's efforts to create climate and community resilience along the Mendocino Coast is a set of activities to address Noyo Harbor fishing and port community needs identified in the Noyo Harbor Community Sustainability Plan (PlanWest Partners, Inc. 2019). The Noyo Harbor administration has sought and secured significant federal grant funds, among other resources, to support those activities. From the initiation of the Noyo Harbor Plan process to the broader

[4] https://www.savingseafood.org/images/acsfletterresfexpansion.pdf, accessed 1/26/25.

visioning, planning and ongoing action, the port, fishing and larger coastal communities have activated bonding, bridging and linking capital.

Most directly related to California fishing community resilience and offshore wind energy development (and with broader application), fishing communities initiated projects to map their fishing grounds and related information. These efforts were prompted by the designation of wind energy areas in federal waters (>3 nm) off northern California and then central California. The 2019-21 North Coast Fisheries Mapping Project was led by the Humboldt Fishermen's Marketing Association in collaboration with coastal community-based commercial fishing associations in Del Norte and Mendocino counties, assisted by a GIS specialist, a trusted science advisor and others in the region. The fishing community leads, assisted by the science advisor, secured funding - including stipends for fishery participants - from the California Ocean Protection Council (OPC) to support the project. The group effort focused on identifying the fishing grounds for 13 commercial fisheries, along with key operational features and considerations for the region's fishing communities at sea and the connection to ports and working waterfronts, which in turn are linked to coastal communities and the larger fisheries social system and seafood supply systems. Modeled on the North Coast effort, the 2021-22 Central Coast Fishing Heritage Mapping Project was led by the Morro Bay Commercial Fishermen's Organization in collaboration with fishermen from Santa Cruz to San Diego, with assistance from the GIS specialist and science advisor and funded by the OPC. Both projects provide examples of fishing community adaptive capacity and resilience via the use and enhancement of community capitals and social cohesion. Moreover, they are examples of the effective use and building of bonding social capital among fishermen from diverse places and fisheries, bridging capital with others with complementary expertise (e.g., GIS, fisheries social science and marine policy) and linking capital to connect with the OPC for financial support and assistance with ensuring appropriate access to and integrity of the project products going forward.

In 2022, following these and other local and regional fishing community efforts and with encouragement from state agencies, fishing community organizations from Crescent City to Santa Barbara came together to form the California Fishermen's Resiliency Association (CFRA). The CFRA's member organizations have collaborated to secure funding support from local, regional and state entities toward preventing, minimizing and mitigating adverse impacts of OSW and other activities that directly affect at-sea and working waterfront communities. These impacts have implications for the larger fisheries social system and coastal communities. The CFRA's efforts to date include engaging with OSW developers, government agencies, and others to advocate for and address fishing community interests, needs and concerns. The fishing community is not homogeneous. The diversity within and across place-based and interest-based communities is both a source of resilience and a source of tension. Investments in individual people, operations, and infrastructure to mitigate adverse impacts and lend resilience are important; however they do not ensure that the community's collective needs are met. Investment in social as well as economic capital is essential in its own right and as a necessary complement to any individual support. The CFRA both represents and serves as a

mechanism for building social cohesion, adaptive capacity and resilience to challenges facing the fishing community.

These examples shed light on some of the many and diverse demands on fishing communities which individually and cumulatively strain existing community capitals. At the same time, they demonstrate capacity for flexibility and resilience within and among California's fishing communities and suggest potential and opportunities for leveraging support, for example, to enhance resilience.

Recommendations

Existing efforts represent and have built community capitals, including trust and social cohesion, within and across the interconnected contexts where fishing communities operate, and can be leveraged and built upon to advance fishing community resilience in the context of OSW development. Based on the literature reviewed and the examples provided, we offer five recommendations for investing in fishing community resilience amid offshore wind energy development. They address the need for specific adaptive skills and mechanisms that contribute - and arguably are essential - to community resilience (Chapin 2018).

Community-centered visioning and planning

Investment in community-centered processes to collectively and iteratively identify and prioritize current and future needs, opportunities and challenges is foundational to maintaining and building social cohesion, adaptive capacity and resilience (Richmond and Casali 2022). For such processes, community members come together to share their knowledge, experience, values and ideas, assess capacities and determine how best to use them. Where capacities may be lacking, the community works together to identify how to build them. Such community collaboration demonstrates and supports optimism and sense of agency and deliberateness in addressing or enacting change (Johnson et al. 2014, Richmond and Casali 2022). However, fishing community visioning and planning can be challenging for multiple reasons especially given the diversity of contexts, individual and community identities, and at-times conflicting priorities individuals and groups face. Mindful of these issues, Richmond et al (2019) developed and documented a collaborative strategy for fishing community visioning and planning in several (place-based) California coastal fishing communities. On the US East Coast, amid heated conflict over significant decline in the Northeast US groundfish fishery, the Northwest Atlantic Marine Alliance (NAMA), a regional commercial fishing organization, partnered with a firm with facilitation and conflict management expertise to work past the conflict and develop a vision for the groundfish fleet (ME CLarke Consulting Blog 2017). Olson and Pinto da Silva (2024) highlight the importance of recognizing and supporting efforts and organizations that are best suited – and trusted by community members – to enable, facilitate and motivate information- and capacity-sharing to address common needs, challenges and opportunities. Investing in a trained facilitator from outside or within the focal community who is trusted by participants as a neutral broker - and maintains that trust throughout - can help ensure that the process is

equitable and productive. The absence of such a neutral broker or the loss of trust can derail the process, its perceived legitimacy, and support for actions that follow (Helvey 2004).

Physical and social infrastructure

Investment in physical infrastructure and equipment such as ice facilities and hoists can help meet pressing needs in fishing communities (see, e.g., Culver et al. 2023) and often is done to mitigate for loss, displacement and disruption of activity due to expanded or new ocean and working waterfront uses including OSW. While such infrastructure is needed and worthwhile, there is growing interest in and need for social infrastructure (Zahnow 2024) – designated places and facilities that enable direct interaction to build community capitals for resilience as well as meet practical needs. Shared spaces and coordinated efforts that bring community members together can increase social cohesion and community wellbeing (Zahnow 2024). For example, following a community needs assessment, Petersburg (Alaska) Community Cold Storage was built in 2006 and, operated by the Petersburg Economic Development Council, provides cold storage, blast freezing, ice sales and packaging space for seafood processors and other businesses in the community (Pomeroy et al. 2020). With the growing interest in direct-to-consumer and local seafood sales - accelerated during the COVID-19 pandemic - community seafood handling and marketing facilities serve practical needs and create spaces for building community capitals and social cohesion among fishery participants and with seafood consumers, to further support fishing community resilience.[5]

Training and support for meaningful participation in decision-making processes

Investment in training activities and programs to support new entrants and enhance the capacities of those already engaged in fishing, seafood handling and fishery-support goods and services strengthens individual and community resilience. Programs such as the Alaska Young Fishermen's Summit, established in 2007 (Cullenberg 2017), and the California Fishing Apprenticeship Program, established in 2019, provide intensive training on land-based aspects of running a fishing operation such as handling, marketing, business management, fishery management and science for management. The California program, which has primarily focused on southern California fisheries, also connects apprentices with experienced fishermen for on-the-water training. These and other such programs are directed toward countering the "graying of the fleet" to enhance fishery and fishing community resilience by equipping individuals with important knowledge and skills critical for adapting to change and fostering the development of community capitals and social cohesion (e.g., Haugen et al. 2021).

In addition, investing in training and support for equitable and meaningful participation in management decision-making is important for fishing community resilience. The Marine Resource Education Program (MREP), founded in 2001 by fishermen in Maine, provides training in "the nuts and bolts of marine fisheries science and management" tailored to the US east and

[5] See, e.g., https://marketyourcatch.msi.ucsb.edu/feature-story for a story about relationships between local seafood businesses and consumers as a source of social and political support in times of need.

west coast regions (MREP n.d.). Participating fishermen, scientists and managers meet in person for two multi-day training events, which enables building and strengthening of community capitals for resilience. Sustained investment in such capacity-building programs helps address inequities in social and political capital essential to meaningful and continuing engagement in management processes. Support to cover the costs of participation in management decision-making processes enables the application of these capacities to the development of better-informed governance.

Cooperative arrangements to facilitate communication and collaboration

As noted above, various types of arrangements have been used to facilitate communication and collaboration within the fishing community and between the fishing community and others for various purposes. JOFLO and the West Coast Crabber-Towboat Agreement, for example, have been established to facilitate communication and collaboration to coordinate space use, minimize conflict and enhance safety and effectiveness of fishing operations and other ocean-based activities (Knaster et al. 1998, Beck 2023). The cable liaison committees, ACSF, CFRA and the community quota funds along with other entities likewise facilitate communication among and beyond ocean users and sponsor and/or conduct research to address information needs. When communication is facilitated and the collective goals, collaboration and community needs are emphasized, the community is more likely to engage and participate (Richmond and Casali 2022, Johnson et al. 2014). Such arrangements reinforce and expand community capitals, social cohesion and fishing community resilience. Participation in such arrangements - and sustaining them - also requires commitment of individual and community time and resources. Investing in cooperative arrangements, for example, by providing funds for support staff and community member engagement to share knowledge and expertise to avoid or minimize conflict and further build resilience.

Representing fishing heritage and culture

Investing in fishing community-led or co-led efforts to document and share fishing community heritage and culture plays a key role in the development and reinforcement of community capitals and is key to fishing community resilience. “Social memory” refers to the importance of local knowledge for reminding communities about how things used to be, to understand how the community responded to change in the past and what the possibilities are for the future (Folke et al. 2005, Johnson 2014, Maine Sea Grant 2010). Documenting and sharing social memory of fishing and seafood heritage and culture within and beyond the fishing community thus is another key to fishing community resilience (Maine Sea Grant 2010). In addition, social memory plays a key role in community-centered visioning and planning. Oral history projects such as the Morro Bay Maritime Museum’s Fishermen Oral History Project and NOAA’s Voices of the Fisheries and Voices from the West Coast (Bartsch et al. 2009) are examples directly relevant to the California context. Local and regional community-led public education and outreach events such as Morro Bay Maritime Family Fun Days bring that heritage and culture – past and present – to the larger community with activities such as fishing gear and seafood handling demonstrations. Similarly, the Noyo Harbor Festival celebrates that community’s local

fishing heritage and Sea to Table dining events bring fishermen and other, diverse community members together to further build community capitals. Local seafood marketing efforts such as San Diego's Tuna Harbor Dockside Market along with locally led events at museums, aquariums and science centers, and working waterfronts foster and strengthen connections within the fishing community and with the larger coastal community and region.[6]

Conclusion

Fishing community resilience - the ability to withstand shocks and stresses without upheaval by coping, adapting or transforming in response to change - is of critical concern to California fishing communities in the face of offshore wind energy development along with myriad other environmental, regulatory and socioeconomic changes. Each of these, on its own and cumulatively, poses challenges and opportunities to individuals and their communities via multiple contexts: at sea, shoreside at working waterfronts and coastal communities, throughout the seafood supply system, and in fishery and broader ocean governance.

Resilience is a function of adaptive capacities found in community capitals within and beyond the fishing community. Maintaining and expanding these capacities and capitals to support fishing community resilience requires investment in mechanisms that serve the community. Toward this end, we recommend five strategies: community-centered visioning and planning; infrastructure/designated places for fishing community use; multi-faceted training for engagement in the range of fishing community contexts; arrangements to facilitate communication and collaboration within and beyond the fishing community; and representation of fishing and seafood heritage and culture. Individually and collectively, these mechanisms both tap into and strengthen social cohesion and diverse capacities essential for fishing community resilience.

California fishing communities possess and have access to community capitals that provide a foundation for efforts to build and enhance fishing community resilience in the face of OSW development amid other challenges. While these capitals are considerable, they are strained by the increasing and complex demands of the diverse contexts that fishery participants and communities must navigate. Sustained OSW developer investment in the fishing community-centered mechanisms identified in this paper can both leverage and strengthen social cohesion, adaptive capacities and thus forward-looking community resilience in response to change.

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[6] See California Seafood Markets: Producer-to-Consumer Direct Markets for more examples.

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