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Balancing Researcher Roles: Lessons from the Sea Grant American Lobster Initiative

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by Amalia Harrington and Jessica Jansujwicz

INTRODUCTION

Marine ecosystems provide society with a wide range of valuable resources and services, including harvestable food and raw materials, protection from storms, shoreline stabilization, nutrient cycling, and critical habitat for marine organisms. These systems provide opportunities for tourism, recreation, education, and scientific inquiry, and have intrinsic value through cultural benefits and religious significance (Barbier 2017). Emerging uses of marine systems, however, present novel challenges to historical or traditional ocean uses. Diverse, often conflicting values and perspectives of the communities and individuals who depend upon these ecosystems for their livelihood and well-being challenge scientists and ocean users to develop means for coexistence. Governance challenges also arise from the dynamic nature of marine resources spanning jurisdictional boundaries (Berkes 2006; Cullis-Suzuki and Pauly 2010), resulting in conflicting mandates (Young 2010) and leaving ocean and coastal users to navigate a confusing array of rules and regulations. The Gulf of Maine, characterized by high socioecological system complexity, exemplifies many of these challenges.

The Gulf of Maine is one of the most productive and complex temperate marine areas in the world (Thompson 2010). Supporting a diversity of species and habitats, the Gulf provides important ecosystem services, including recreational and commercial seafood harvesting. The Gulf of Maine is home to the American lobster (*Homarus americanus*), which supports one of the largest and most economically valuable single-species fisheries in the United States (ASMFC 2020). Moreover, the seafood sector in Maine contributed over $3 billion in total economic output to Maine's economy in 2019 (Wallace and Colgan 2023). These vital services and the socio-cultural identity of many coastal communities in the region are at risk due to wide-scale climate-related changes, including rapid rates of ocean warming, changes in ocean chemistry and circulation, and increasingly frequent extreme events (Lucey et al. 2023). Additional challenges include balancing historical uses of the Gulf with the growing offshore renewable energy and aquaculture sectors, and alterations to traditional fishing methods to protect the critically endangered North Atlantic right whale. Given the confluence of changes in the region, it is no surprise that scientists often find themselves in the middle of emotionally charged discussions due to the need for (and often lack of) robust scientific evidence to inform the decision-making process, forcing scientists to balance different roles to achieve solutions in a collaborative and inclusive manner.

SCIENTIST-INDUSTRY-MANAGER PARTNERSHIPS AS A SOLUTION

Science–industry–manager collaborations offer a potential solution to advance knowledge, navigate competing demands, and develop more effective management of shared ocean spaces. Addressing complex and emerging ocean sustainability issues requires strong stakeholder participation (Bamzai-Dodson et al. 2021). Yet, while promising, engaged participatory processes that emphasize codevelopment and colearning among scientists and practitioners face significant challenges.

In theory, the inclusion of stakeholders in the design and implementation of research and outreach serves to better incorporate different forms of knowledge and address diverse values, motivations, and interests; and it also can fundamentally change the way knowledge is produced, used, and shared in transformational sustainability science (Lang et al. 2012). Knowledge coproduction is a means to produce useable knowledge (Dilling and Lemos 2011) that organizes and facilitates stakeholder participation by encouraging participants to remain interested in and continuously contribute to the process, a core tenant of transdisciplinary sustainability science (Kruijf et al. 2022). In practice, however, these participatory approaches transcend traditional research settings, demanding a transformation in the role of the scientist (Bulten et al. 2021).

In meeting the demand for more inclusion and engagement in the scientific process, scientists are increasingly called upon to play multiple, often conflicting roles ranging from scientific expert, change agent, knowledge broker, and

process facilitator. Scientists contribute to the integration of knowledge and disciplines (e.g., as a "knowledge broker" or "intermediary" [Hilger et al. 2021]), and to the engagement of stakeholders to support decision-making through participatory research and stakeholder partnerships (Macher et al. 2021). However, researcher roles and the activities performed in these different roles, are complex, often overlapping, and defined contextually. In highly controversial and emotionally charged contexts, scientists are challenged to combine new participatory roles when engaged in dialogue and action for change with more traditional knowledge-oriented roles (Bulten et al. 2021). In light of these challenges, there is a growing need to understand the role of researchers in knowledge coproduction processes.

This review aims to understand the tensions, paradoxes, and dilemmas that arise in a collaborative research setting by drawing on the National Sea Grant American Lobster Initiative's (ALI's) efforts to increase the industry's resilience to the biological, economic, and social impacts of ecosystem change in the Gulf of Maine, Georges Bank, and southern New England. The complex decision space around the American lobster industry offers an exemplary opportunity to understand and inform the role of science-industry-manager partnerships to support decision-making in the context of a rapidly changing ocean environment. From our leadership role in the ALI, we explore the role(s) of scientists in research-industry collaborations and contribute to an enhanced understanding of the processes that hinder or facilitate the success of collaborative initiatives applicable to a broad array of ocean sustainability contexts.

The ALI: Collaborative by Design

Maine's American lobster fishery is the largest on the East Coast, contributing up to 80 percent of Maine's total commercial landings by ex-vessel value (Maine DMR 2023) and more than $1 billion to Maine's economy (Wallace and Colgan 2023). The lobster stock in the Gulf of Maine and Georges Bank is considered healthy and abundant, but a changing environment has been linked to the ongoing decline in the southern New England stock (ASMFC 2020). Lobster biology is directly affected by rising temperatures, but there is a need to better understand the full effects of a rapidly changing environment on this iconic species.

To address critical knowledge gaps about American lobster and its fishery in a dynamic and changing environment, the ALI was created in 2019. The ALI supports scientific research through the National Sea Grant American Lobster Research Program, which explores topics ranging from the influence of environmental change on larval development and stock dynamics, to socioeconomic lessons learned from southern New England's stock collapse and alternative bait opportunities. Complementing the research program is the Northeast Regional Lobster Extension Program, which ensures industry and management stakeholders across the Northeast benefit from findings of the ALI. Maine Sea Grant provides leadership and overall coordination for the Extension Program with New Hampshire, Massachusetts Institute of Technology, Woods Hole Oceanographic Institute, and Rhode Island, Connecticut, and New York Sea Grant programs providing locally relevant components that contribute to regional efforts and activities.

The ALI network has representation from over 40 institutions, including a regional steering committee of industry and management agencies from across the region. The diversity of environmental conditions, management schemes, fishing methods, and status of the resource across the Northeast results in a broad range of opinions, views, and values. As a convener of partners and facilitator of discussions around science, the challenge is to navigate these different views, particularly during emotionally charged discussions related to major changes in ocean uses (e.g., offshore wind development, aquaculture). We share important lessons learned from ALI's process of building bridges through collaborative research partnerships between state agencies, academia, and industry members to navigate challenges at the interface of science and society.

Bridging the Science and Stakeholder Spaces

The ALI works to ensure that members of the lobster industry, research, and management communities increase their understanding of the impacts of ecosystem change on this important species. To do this, the extension program has employed a variety of methods to communicate the findings from the research program while encouraging discussion, collaboration, and codevelopment of new projects. These methods include traditional modes of science communication, like peer-reviewed publications and presentations at scientific meetings, along with the development of interactive web-based stories, factsheets, and articles for industry newspapers. One of the more well-attended efforts is the Collaborative Chats webinar series, which highlights successful research partnerships between scientists, industry

members, and managers focused on American lobster. Developed by Maine Sea Grant in collaboration with the Maine Department of Marine Resources and the University of Maine's Lobster Institute, Collaborative Chats has created a space for discussion of the latest research on American lobster while strategizing how to make collaborative research a priority.

Maine Sea Grant staff contribute a variety of expertise, including research experience in lobster biology, community engagement, and communications development. The extension program relies on the regional steering committee to provide insight on emerging stakeholder needs in response to new industry challenges. Maine Sea Grant facilitates discussions between the research teams, other Sea Grant partners, and members of the regional steering committee to develop useful and informative content for workshops, educational products, and outreach materials. The extension program also works across the region to engage additional industry members and scientists through meetings, informal surveys, and listening sessions. These efforts include targeted engagement at industry-focused meetings, such as the Maine Fishermen's Forum and the Massachusetts Lobstermen's Association Annual Weekend and Trade Show, and meeting lobstermen where they feel comfortable (e.g., at the docks and established management meetings).

The ALI also aims to move transdisciplinary research outside of the classroom through student training opportunities. The growing research network supports over 25 graduate and undergraduate students who are gaining hands-on experiences in a variety of scientific skills, methods, and disciplines, including cutting-edge laboratory projects, field-based research with state agencies and fishermen, multi-institutional modeling efforts, and projects that employ social science practices. ALI students are also gaining experience working on collaborative research teams and learning effective science communication practices. Other professional development opportunities include contributing to Collaborative Chats, developing featured blog posts with Sea Grant communications specialists, and sharing their work on the "Coastal Conversations" radio show, a public affairs program produced by Maine Sea Grant that focuses on issues relevant to Maine's coastal communities.

The overarching goal of the ALI is to increase cross-sector connections to enhance future opportunities for collaboration, particularly in response to a changing environment, and to implement practical solutions to address novel challenges. One of the greatest platforms for this work is the ALI's Regional Lobster Research and Outreach Summit. The summit provides an opportunity for all members of the ALI network to share research updates, receive feedback from partners, and embark on new collaborative research and extension projects. Scientists are invited to take an active role in creating the content for presentations and workshops, and the regional steering committee is consulted in the design of industry-focused sessions. New voices, including students and early-career researchers, are invited to attend the summit with the hope of increasing representation and continuing to build the network to coproduce research relevant to the lobster industry. Additionally, and critical to fostering a sense of community, the summit offers a space for socializing and networking.

LESSONS LEARNED

Fostering Collaborations

The ALI's research-to-extension-to-research design combines and integrates expert knowledge with empirical and scientific knowledge. This structure provides a unique opportunity to learn what can be gained from the integration of knowledge and practices across boundaries and groups. The ALI works to ensure that representatives from all sectors related to American lobster have the opportunity to contribute to identifying both the attributes of a resilient lobster industry and the research, technical, and outreach needs related to building ecological and socioeconomic resiliency. The science-industry-manager partnerships formed through the ALI have not only advanced knowledge about lobster in a changing environment, but have assisted the network in meeting emerging needs while navigating and balancing competing demands of the knowledge and stakeholder spaces.

The partnerships built within the ALI network allow scientists to produce knowledge while remaining connected to society. In a coordination role, Maine Sea Grant helps bridge the gap between knowledge producers and knowledge users and facilitates the integration of knowledge production and use to develop solutions. Through Collaborative Chats, ALI challenges diverse research teams to communicate their work to a broad audience with a range of backgrounds and scientific training, encouraging presenters to share the challenges and benefits of collaborative science as a means of learning by doing. Researchers have embraced an active role in creating and maintaining the webinars as a space for societal learning and co-production of knowledge, and Maine Sea Grant plays

multiple overlapping roles as the host. As process facilitator, Maine Sea Grant guides the discussion to enhance communication and enable the learning process. By bringing disparate researchers working on similar topics together to discuss and develop new research questions, Maine Sea Grant has taken on the role of capacity builder. Given the diversity of attendees at these sessions, Maine Sea Grant also steps in as an intermediary to reduce tensions during the discussion of highly contentious topics (e.g., whale regulations, offshore wind). Collaborative Chats is a prime example of how the ALI combines knowledge production with facilitation and reflection as it focuses on synthesizing, integrating, and mediating diverse knowledge sources and perspectives.

Ensuring All Voices Are Heard

Navigating differences in knowledge and values among participants is a common challenge in addressing ocean sustainability issues. ALI is an example of finding the right forms of participation, addressing different power relationships, ensuring different interests and thought styles are made transparent, and advocating the need for coexistence of different views. By working with known leaders in the industry and management sectors, Maine Sea Grant has developed strong relationships with a variety of individuals and groups to ensure all voices are heard and everyone is given an opportunity to contribute to the development of scientific research. At the same time, important lessons have emerged through learning by doing. Collaborative research requires trust, which takes time to develop. In building relationships, ALI partners have been successful by actively listening to potential collaborators and acknowledging the strengths and expertise of others and through the use of formal and informal spaces and discussions. By approaching partnerships with a level of mutual respect, scientists are better positioned to conduct research that meets the needs of potential end-users. The different roles scientists play are context-dependent, highlighting the need to remain flexible and adaptive when building networks.

Balancing Knowledge and Action

The ALI is dynamic and roles have changed overtime. Reflecting on this process offers a pathway for combining more traditional researcher skills with more engaged roles. As researcher roles continue to adapt with the emergence of new information and partnerships, reflexive discussions such as this review of ALI can support learning and foster creativity for addressing tensions, combining, and balancing different roles in research-industry-manager partnerships. The ALI is an excellent case study to reflect on the different roles of researchers in transdisciplinary "learning" (e.g., more "action-oriented roles") and to share lessons learned about the role of science and scientists in navigating the science-society boundary.

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