

**Project Title:** Social Constraints and Solutions to Progressive Development of the Nation's Offshore Aquaculture Industry

**Project Hypothesis:** The overarching hypothesis of this study is that human rather physical-environmental factors present the most significant challenges to the development of an offshore aquaculture industry in the United States, and that such challenges are readily identifiable through systematic research interaction with experts involved in the development and governance of such an industry. Auxiliary hypothesis are: (1) principal constraints tend to vary in relation to the regional context, and (2) there will be a strong agreement amongst key persons with regulatory, industry, research, and non-governmental sectors for overarching national policy guidance for offshore development.

**Project Goals and Objectives:** The intent of this project is to provide NOAA Sea Grant and other public sector agencies with important information and analysis regarding expert perspectives on the various factors that have constrained or continue to constrain progressive development of the nation's offshore aquaculture industry. The project is outcome-oriented, and thus the parallel goal of the effort is to generate and provide objective analytical discussion regarding expert perspectives on what would constitute viable means and measures for mitigating or eliminating such constraints. Specific objectives required that the research team: (1) ascertains a thorough understanding of the range of social, economic, environmental, cultural, and ocean space-use challenges that have been and/or are currently being experienced and/or observed by participants in the nascent offshore aquaculture industry; (2) ensures that this understanding is validated and expanded by persons representing the spectrum of social groups

directly involved in, formally overseeing, indirectly observing, and potentially working and recreating in areas adjacent to the industry; (3) acquires a thorough understanding of options for mitigating or precluding the range of constraints and challenges as these are envisioned by the categories of persons and groups above; and (4) reports to the project sponsor and other interested parties in a timely, well-organized, and useful manner.

**Project methodology:** The study uses a case study approach focusing on three areas/regions of Hawaii, Southern California and Gulf of Maine. A multi-regional approach was chosen to facilitate understanding of geographic variability in constraining factors and overarching social context, in addition to generating lessons useful for informing offshore marine aquaculture planning in other areas and regions of the United States. The three regions were chosen in consultation with people with knowledge within the field of aquaculture research; the aquaculture industry, and regulatory agencies. They were chosen based on the presence to varying degrees of marine aquaculture research and commercial production, in addition to IAI's own expertise and involvement in these regions.

Research methods include: 1) archival research; 2) purposive social network-based sampling among regulatory agencies, industries, and research institutions involved in open-ocean aquaculture; and 3) in-depth and follow-up interviews with key persons active in each of the above sectors across the study regions. Our research efforts and analysis are informed by social network methodology, cultural consensus modeling, and sociological theories of effective collaborative management. The approach ensures that research is conducted in a highly systematic way; the data generated is qualitatively rich and quantifiable; and the analysis is of direct utility for policy deliberations.

Social network sampling technique is used to identify topical and technical experts involved in permitting, regulating, and developing open ocean and offshore aquaculture as well as public officials and other stakeholder groups. Cultural consensus modeling identifies domains and degree of shared understanding within and between groups and as such can serve to support dialogue, guide decision-making, and facilitate policy-making processes. The analysis of social capital can identify structural weaknesses in collaborative management processes and methods in order to improve cooperation.

***Literature Review:*** The objective of this component of the project is to identify ongoing factors affecting the development of offshore aquaculture; including developments in technology, scientific knowledge, stakeholder collaborations, policy formulations, and marine spatial planning; and outcomes of currently proposed offshore aquaculture projects. The following kinds of materials were reviewed:

- (1) technical reports developed by or for government agencies including environmental assessment/impact statements of proposed projects, legislative hearings, white papers, and aquaculture workshop proceedings, and lecture series;
- (2) scientific journal articles on environmental impacts, best management practices, economic evaluation, and consumer studies of aquaculture;
- (3) GIS data sources and software programs for use in open ocean aquaculture siting projects;
- (4) and sociologically informed theoretical research on resource management in general and aquaculture more specifically.

***Ethnographic Fieldwork and Interviewing*** was conducted in each study region in two phases. A wide range of experts in the various study regions and in various aquaculture sectors

were consulted during the course of the project and thereby contributed significantly to development of the description and analysis. A total of 131 interviews were conducted; interviews varied in length from 30 minutes to one and half hours. Interviews were held with staff members in county, state, and federal agencies that are involved in permitting and/or promoting aquaculture in state and federal waters; entrepreneurs, operators, and private consultants involved in the development of open ocean aquaculture in state and federal waters; university affiliates currently involved in research germane to the development of aquaculture in federal waters; and staff at non-governmental organizations that have had interests in the development of marine aquaculture. Some expert respondents were interviewed multiple times. In addition to one-one on interviews, researchers attended a Global Aquaculture Alliance Standards meeting, California Coastal Commission public hearing for proposed federally sited aquaculture operation in California, and World Aquaculture Society Meeting in Seattle. The table below depicts the distribution of respondents across geographical location and by sector.

**Interview Respondents by Category**

Category of Respondent	Location				Total
	California	Hawaii	Gulf of Maine	Other	
(Quasi) Government Agency					
Federal	2	7	3	8	20
Regional	0	1	1	2	4
State	4	4	3	0	11
County	0	1	0	0	1
Aquaculture Industry	8	7	5	2	22
University/Research	3	4	8	1	16
Non-profit	5	0	5	4	14
Fishing Community	2	6	3	0	11
Other	2	2	3	0	7
<b>Total</b>	<b>26</b>	<b>32</b>	<b>31</b>	<b>17</b>	<b>106</b>

***Information and Analysis contained in the Final Report:*** In addition to an introductory chapter that addresses the research problem, goals, and methodology, the final report includes: 1) pertinent aquaculture statistics; 2) current regulatory framework for offshore aquaculture

development; 3) characterization of Southern California, Hawaii, and Gulf of Maine for offshore aquaculture development; 4) description of proposed and permitted open ocean operations ( in state and federal jurisdiction waters) in the aforementioned three regions; 5) the involvement of non-governmental organization in the development of marine aquaculture; 6) the status of and debates regarding marine spatial planning for open ocean aquaculture; and 7) overview analysis of regulatory, economic, and social challenges and solutions to the development of offshore aquaculture. A preliminary report on findings and progress was completed in January 2014 and revised in March 2014. A summary of a draft interim technical report (March 2014) was distributed to 18 respondents; the draft full report was distributed to seven respondents. The draft final (full and summary) report was completed and reviewed by key respondents in January 2015. Members of NOAA's Marine Fisheries Advisory Committee (MAFAC) Aquaculture Task Force have requested the research findings. The report is currently undergoing minor revisions in consideration of this audience and their assigned task. Additionally, a journal article is forthcoming.