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State Aquaculture Coordinators Study Report

PREPARED FOR THE NATIONAL ASSOCIATION OF STATE AQUACULTURE COORDINATORS

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EXECUTIVE SUMMARY

This study was performed in partnership with the National Association of State Aquaculture Coordinators (NASAC) and a research team from the School of Public Affairs, University of Colorado Denver, including Assistant Professor, Dr. Chris Weible and PhD Candidate, Saba Siddiki. The project involved interviews (n=10) and an online survey (N=56) of NASAC members. Of the 56 individuals to whom the survey was sent, 32 individuals responded, yielding a 57% response rate.

The collaboration between NASAC representatives and the UCD research team began in the fall of 2009 at which time both parties agreed upon a set of mutually beneficial objectives for the study and research design. These objectives and a summary of findings for each are listed immediately below.

Project Objectives and Study Findings

Objectives	Study Findings
1) Identify how various groups within the aquaculture community are networking with one another.	Industry members tend to have favorable views of one another and often share their knowledge of the scientific/technical and regulatory/administrative aspects of aquaculture with one another. State coordinators reported strong ties with industry and state-level organizations and weaker ties with national-level organizations.
2) Map the regulatory landscape within each of the states, including, looking at issues of regulatory stringency, monitoring and enforcement of regulations, compliance, and the relationship between state and non-state actors in shaping aquaculture regulations and policy.	State Coordinators reported positive perceptions of the regulatory landscapes in their states. While they were equivocal about the level of stringency, they perceived regulations as modestly clear in describing allowed and forbidden activities. They also reported few severe penalties for noncompliance. Compliance with aquaculture regulations is fairly high with most instances of non-compliance identified by monitoring and enforcement personnel of government

	agencies. The degree to which members of the aquaculture industry participate in monitoring and enforcement of aquaculture regulations varies from high to low across states.
3) Identify perceptions of aquaculture related problems in the different states, challenges to the involvement of the aquaculture community at the state level, and identify ways in which state aquaculture communities have effectively addressed challenges.	The most significant barriers to aquaculture development were start up costs, input costs, resource constraints, and stringent environmental protection regulations and safeguards. The least significant barriers to aquaculture development were cohesiveness or cooperation among industry members, general public resistance to aquaculture development, local user conflicts, and inexperienced farmers.
4) Examine the role of NASAC in providing resources and information to State Coordinators as well as the role of NASAC and State Coordinators in helping the industry achieve administrative and political goals.	The NASAC has been effective in providing information and resources to NASAC members to keep them informed on important aquaculture issues across the U.S. They were least effective in providing administrative and political support. State Aquaculture Coordinators have little authority to shape the development of the aquaculture industry in their respective states and usually act in an advisory capacity providing administrative support to members of the aquaculture industry.

From this study, we offer the following strategies for NASAC leaders and members to consider:

1. Continue current activities that promote and encourage aquaculture in the United States by maintaining a consolidated voice and in offering administrative and political support to state aquaculture coordinators.
2. Maintain and improve communication channels of activities in other states and encourage diffusion of both innovations and failures.
3. Continue to serve as the liaison between state-level coordinators and national-level organizations. In this effort, develop a long-term strategy for creating a stronger national position that transcends each individual state to influence national aquaculture development.

4. Consider outreach to the states not responding to this survey; it could indicate lack of involvement or low satisfaction with NASAC.
5. Given limited resources within each state, develop a long-term strategy for supporting political efforts within and across states. This might include organizing and coordinating a team of experts and advisors to aid industry across states in their political efforts.
6. Capitalize on the positive relations among aquaculture community members in mobilizing support for the aquaculture industry within states and at the national level.
7. Respondents request more frequent interactions and meetings with higher attendance. Develop alternate strategies for possibly more frequent meetings that circumvent budget cuts (e.g. web conferences).

The information collected in this study will be used to help NASAC and their collaborators achieve their objectives and to support dissertation research and peer-reviewed publications focusing on the factors that shape compliance with aquaculture regulations.

SECTION 1: PROJECT OVERVIEW

OBJECTIVES

Aquaculture is defined as, "the farming of organisms that live in water, such as fish, shellfish, and algae" (USGS, 1996). Aquaculture is an increasingly salient issue in the United States. The United States currently produces approximately 20% of its seafood consumed while importing 80%, resulting in a seafood trade deficit that exceeds 9 billion dollars (NOAA, 2009).

Aquaculture development in the United States faces a number of barriers: an uncertain regulatory landscape (Firestone, 2004; Wirth, 1999), complex interdependencies among ecological, economic, technical, and social factors (Firestone, 2004), resistance from the general public regarding farmed seafood (Mazur, 2006; Amberg, 2010), conflict about aquaculture development (Kaiser & Stead, 2002), and numerous concerns about the industry from disease control to degradation of marine ecosystems (Black, 2001; Francik, 2003; Treece, 2002; Naylor, 2000; Mazur, 2006).

To gain a better understanding of aquaculture development across different states, this study provides a comprehensive and systematic understanding of the status of regulations and the needs and concerns of members of aquaculture communities across the United States through interviews and an online survey of members of the National Association of State Aquaculture Coordinators (NASAC). Through collaboration of NASAC leadership as well as the team of researchers from the University of Colorado Denver, four objectives were identified.

Objective 1. Identify how various groups within the aquaculture community are networking with one another.

Objective 2. Map the regulatory landscape within each of the states, including, looking at issues of regulatory stringency, monitoring and enforcement of regulations, compliance, and the relationship between state and non-state actors in shaping aquaculture regulations and policy.

Objective 3. Identify perceptions of aquaculture related problems in the different states, challenges to the involvement of the aquaculture community at the state level, and identify ways in which state aquaculture communities have effectively addressed challenges.

Objective 4. Examine the role of NASAC in providing resources and information to State Coordinators as well as the role of NASAC and State Coordinators in helping the industry achieve administrative and political goals.

RESEARCH DESIGN

The research design consisted of 10 interviews with members of NASAC in addition to the administration of an online survey to all 56 coordinator and non-coordinator members. The NASAC team provided a list of names of individuals to contact for interviews. All interviewees from this list were contacted with a request to participate in an interview for the study. Those who responded to the request were interviewed formally using the protocol described below. The interviews were conducted in the fall of 2009. The survey was administered in March 2010.

INTERVIEW PROTOCOL

The interview questions were designed in relation to the study's objectives. Once a draft of the interview protocol was completed by the UCD team, it was sent to the NASAC for review and suggested content and editorial modifications. Once the interview protocol was approved by both teams, a pilot interview was conducted with a member from the NASAC team to confirm that the interview questions and protocol length were appropriate and that the questions were suitable given the research intent. Following the pilot interview, an additional nine interviews were conducted.

A complete list of interview questions is provided below.

1. How long has aquaculture been in practice in your state?

2. What is the current state of development of the aquaculture industry?

3. What are the state level policies that impact aquaculture in your State?

4. What are the types of permits that aquaculturists in your state are required to have for general operating purposes?

5. Is it difficult to obtain aquaculture permits in your State?

6. What do you feel is the level of understanding among aquaculturists regarding activities that are allowed and forbidden?

7. What do you feel is the level of understanding among those enforcing permit requirements regarding activities that are allowed and forbidden?

8. What is the level of community involvement in the permitting process (i.e. development, means of administration, etc.)?

9. How severe do you think sanctions are in your state when it comes to non-compliance with permit requirements?

10. How reliably do you feel sanctions are imposed?

11. Do you think peer pressure among aquaculturists helps to enforce compliance with permits, regulations, etc.?

12. What is the level of regulatory compliance in your State?

13. What types of monitoring and enforcement systems exist in your State regarding aquaculture activities?

14. On what issue(s) has monitoring and enforcement been most difficult?

15. Who do you consider, people and/or organizations, to be particularly influential when it comes to aquaculture activities in your State?

16. Are there any multi-stakeholder processes in existence?

17. What role has/does NASAC play in providing resources and information to State Aquaculture Coordinators to address aquaculture related issues?

18. What role have NASAC and State Coordinators played in helping the aquaculture industry achieve administrative and political goals?

19. Which groups in the aquaculture industry do you tend to coordinate with most frequently?

20. On whom do members of the aquaculture community tend to rely to obtain information and/or resources on various aquaculture-related issues?

21. What would you say are currently the biggest barriers to aquaculture development in your State?

22. What strategies does the industry use to overcome barriers to aquaculture development?

ONLINE SURVEY

Using interview responses, the UCD research team crafted a survey to supplement findings from the interview. Several questions from the interview protocol were expanded to capture more dimensions on the issues of interest. Further, as the survey was administered to a significantly larger sample (56 potential respondents compared to 10 interviewees), it was used to capture a wider diversity of viewpoints.

The survey was administered in an online format using an online survey platform offered through California State University, Sacramento, called Select Survey ASP Advanced. Prior to receiving the survey, potential respondents were sent an invitation to participate explaining the purpose and procedures of the study, possible risks and benefits associated with participation, and details relating to the confidentiality of respondents' answers. Following the administration of the survey, three reminders were

sent to non-respondents requesting their participation in the survey. Two of these reminder emails were sent by a member of the UCD research team and one was sent by a member of the NASAC team.

SAMPLE CHARACTERISTICS

The sample of participants for this study included those individuals currently listed as state aquaculture representatives in the NASAC database. In many cases these individuals are the State Aquaculture Coordinators from the different States. Where there is no official Coordinator, these individuals are selected to serve as representatives to NASAC either due to their professional position or influence in the respective aquaculture communities. Some states have more than one representative, while others do not. The survey was sent to all individuals listed in the database per state. In addition to all 50 U.S. states, four U.S. territories and their respective aquaculture representatives were included in the NASAC database. The U.S. territories included in the sample were American Samoa, Guam, Puerto Rico, and the Virgin Islands. The total number of representatives from the U.S. States and territories is 56. The online survey was sent to each of these 56 individuals.

SECTION 2: SUMMARY OF RESULTS

The following section provides a summary of results for each of the questions asked in the online survey in addition to some of the questions posed in the interview protocol. Following a general discussion of survey response and respondent characteristics, the results summary will be organized around the project objectives.

SURVEY RESPONSES

Of the 56 individuals to whom the survey was sent, 32 individuals responded, yielding a 57% response rate. Table 1 displays the percentage of states representation per geographic region. States were grouped according to the U.S. Census Bureau's regional distinctions. No U.S. territories were represented.

Table 1. Respondent States by Region

Region	% of States Represented
West	46%
Midwest	75%
Northeast	56%
South	59%

Each state had one respondent except for Alaska and Ohio, which had two respondents. So that Alaska and Ohio were not overrepresented in the analysis, the mean was calculated between each of these states' two respondents' responses to produce a combined response. This mean calculation was conducted for questions/responses that represent state level variables, versus individual level variables. For example, the responses of the two respondents from Alaska and Ohio were not combined for questions such as those asking survey respondents to indicate their sex, years employed in each professional position listed, and educational background. They were combined for questions such as those asking survey respondents to provide details about the level of compliance and characteristics of the permitting and regulatory processes in their respective states.

Accounting for the two states for which the respondents' responses were combined, that actual sample size (N) with which the data analyses were conducted was 30 out of 50 states.

RESPONDENT CHARACTERISTICS

To provide background information about the respondents and a foundation for meeting the objectives, this study included a set of demographic questions to understand the characteristics of the respondents. These background questions aid in interpreting the remaining questions in the survey.

SEX

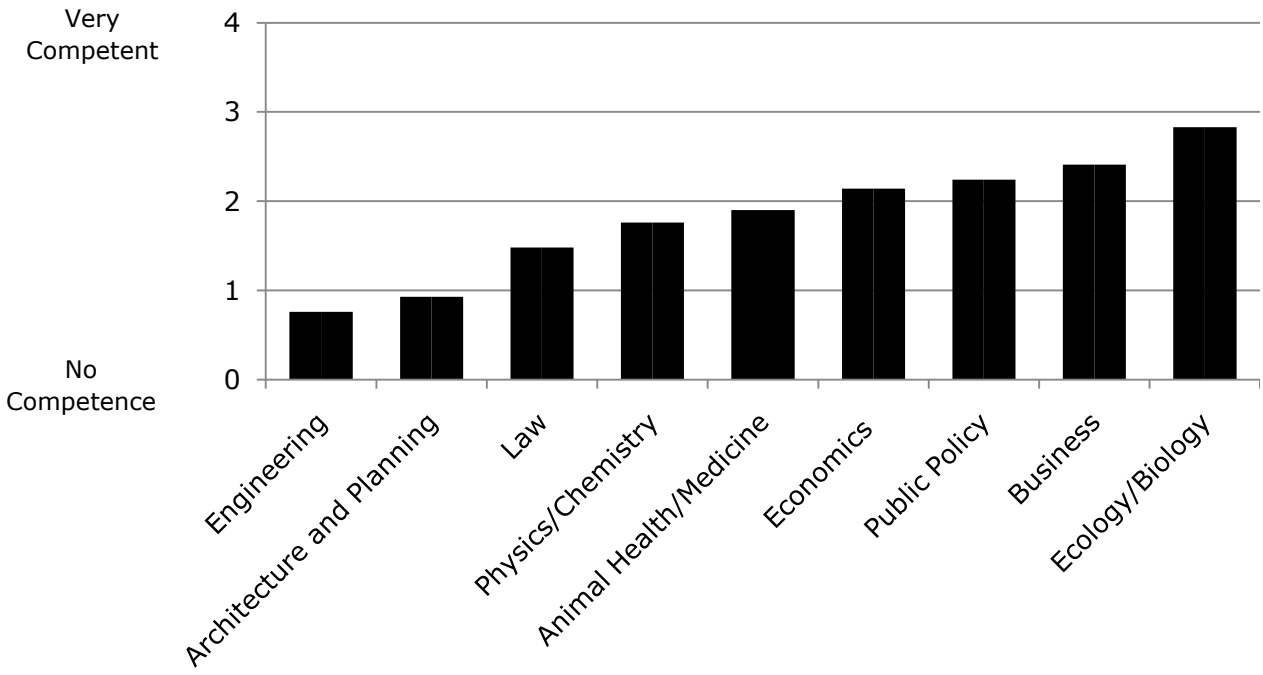
Of the 32 individuals who responded to the survey, 6 (18.8%) of these were female and 22 (68.8%) were male. Four respondents did not answer this question.

EDUCATION

Respondents were asked to indicate their highest level of education. Among the 29 individuals who responded, one (3.5%) attended some college, 11 (37.9%) earned a Bachelor's degree, 13 (44.8%) earned a Master's or other type of professional degree, and four (13.8%) earned a PhD, MD, or JD.

Respondents were also asked to indicate the disciplinary fields in which they are most competent on a scale from 0-4, with 0 having no competence and 4 being very competent. The field options included: Physics/Chemistry, Ecology, Biology, Engineering, Economics (e.g. Agriculture/Natural Resource Economics), Business, Architecture and Planning, Public Policy, Law, and Animal Health/Medicine (e.g. Veterinarian, Fish Health Pathologist, etc.). The mean competencies for each of these fields across the 29 individuals that responded to this question are displayed in Figure 1. The respondents were most competent in ecology/biology and business and least competent in engineering and architecture and planning.

Figure 1. Mean Competencies by Discipline (N=29)



PROFESSIONAL RESPONSIBILITIES

Five questions were asked on the survey about the professional responsibilities of the state aquaculture coordinators. Of those sampled, 29 individuals responded to this set of questions. Table 2 provides a breakdown of the responses to these questions, indicating the percent of respondents that chose each response, as well as the mean scores across all 29 respondents for each of the questions.

From Table 2, the responses indicated:

1. More than 50% of responding State Aquaculture Coordinators perceived their role as advisory with little decision-making authority, reported that they provided mostly administrative support, and indicated that they provide scientific/technical support on aquaculture issues in their state.
2. The respondents were equivocal about the level of political support they provide on aquaculture issues in their state and about having a lot of authority to shape the development of aquaculture industry in their state.

Table 2. Professional Responsibilities

Question: Please indicate how much you agree or disagree with each of the following statements (N=29).

Response Options	Strongly disagree (-2)	Mildly disagree (-1)	Neutral (0)	Mildly agree (+1)	Strongly agree (+2)	Mean
a. I have a lot of authority to shape development of the aquaculture industry in my state.	17.2%	20.7%	17.2%	31.0%	13.8%	.1
b. My role is mostly advisory and I have little decision making authority.	20.7%	17.2%	6.9%	17.2%	37.9%	.3
c. My primary role is to provide scientific/technical support on aquaculture issues in my state.	13.8%	10.3%	17.2%	24.1%	34.5%	.5
d. My primary role is to provide administrative support on aquaculture issues in my state.	3.4%	6.9%	27.6%	27.6%	34.5%	.8
e. My primary role is to provide political support on aquaculture issues in my state.	20.7%	10.3%	31.0%	20.7%	17.2%	.1

Objective 1: Identify how various groups within the aquaculture community are networking with one another.

To address the first objective on the networking characteristics of the State Aquaculture Coordinators, respondents were asked to select influential actors and how information is being shared among members of their aquaculture community. Respondents were also asked three questions about their perceptions of the relations among aquaculture industry members.

INFLUENTIAL STAKEHOLDERS

The state aquaculture coordinators were asked to identify the organizations most influential in the governance of aquaculture in their states.

Respondents tended to list state and local organizations as being the most involved with nearly every respondent citing state wildlife agencies as being involved and approximately two thirds citing state departments of agriculture. The aquaculture industry and federal agencies, such as the U.S. Fish and Wildlife Service and the U.S. Environmental Protection Agency, were cited less.

State and Local Stakeholders

- State Wildlife Agency (selected 29 times)
- State Department of Agriculture (selected 23 times)
- State Environmental Protection Agency (selected 18 times)
- State Aquaculture Association (selected 15 times)
- State/local industry members (selected 15 times)

Federal Stakeholders

- U.S. Army Corps of Engineers (selected 14 times)
- U.S. Food and Drug Administration (selected 13 times)
- U.S. Fish and Wildlife Service (selected 12 times)
- U.S. Environmental Protection Agency (selected 11 times)

This question also included an 'Other' category providing an opportunity for respondents to list other organizations involved in the governance of aquaculture in their states that were not included on the list provided. Respondents listed the following organizations in this category: The Department of Environmental Conservation, the Department of Fish and Game, the Department of Health, the Department of Natural Resources, local coastal districts, the National Association of State Aquaculture Coordinators (NASAC), the State Department of Marine Resources, and the State Marine Resources Commission.

INFORMATION FLOWS

Survey respondents were asked to identify the organizations they relied upon for information, as well as to whom they tend to provide information. Table 3 provides a summary of the individuals cited in relation to one another for the following three questions: (1) To whom do you provide information as State Coordinator on aquaculture related issues?; (2) On whom do you rely to obtain information on aquaculture related issues?; and (3) On whom does the industry rely to obtain information on aquaculture related issues?

Table 3. Distribution of Information Sources

Response Options	"To whom do you provide information as State Coordinator on aquaculture related issues?"	"On whom do you rely to obtain information on aquaculture related issues?"	"On whom does the industry rely to obtain information on aquaculture related issues?"
Members of the industry	89%	71%	71%
State Aquaculture Association	79%	50%	71%
State Agencies	64%	50%	79%
State University Extension Service	57%	79%	61%
Coordinators from other states	61%	68%	18%
NASAC	61%	64%	21%
Regional or Species Specific Association	43%	54%	50%
National Aquaculture Association	21%	39%	36%

Note: Percents indicate the number of respondents out of 28 who indicated each organizational category as a recipient of their information, as a source of their information, and whom they perceive the industry relying on information. Organizations are ranked from most cited recipient of information.

The results from Table 3 indicate:

- More than 60% of respondents provided information on aquaculture related issues to members of the industry, the respective state aquaculture association, state agencies, coordinators from other states and NASAC.
- More than 60% of respondents relied on members of the industry, coordinators from other states, NASAC, and state university extension service for information.
- More than 70% of state aquaculture coordinators perceived industry members as relying on state agencies, the respective state aquaculture association, and other members of the industry for information on aquaculture related issues.
- The biggest perceived differences in the sources of information for industry compared to state aquaculture coordinators involve industry's high reliance on state aquaculture associations and state agencies and low reliance on coordinators from other states and NASAC.
- State coordinators were less likely to report contacts with national-level organizations.

INDUSTRY CHARACTERISTICS

INDUSTRY RELATIONS

Respondents were asked a series of questions about the relations among members of the aquaculture industry in their state. These questions were asked to gain a better contextual understanding of aquaculture communities in the different states, as well as to gain more insight into how the characteristics of the aquaculture industry may impact the regulatory processes relating to aquaculture. Table 4 provides a breakdown of the responses to these questions, indicating the percent of respondents that chose each response, as well as the mean scores across all respondents for each of these questions. For this series of questions, the number of respondents varied from 27-28.

Overall, across the states, the results indicate:

- More than 60% of state aquaculture coordinators perceived frequent sharing of information among aquaculture members on scientific/technical issues as well as regulatory/administrative issues.
- At least 50% of state aquaculture coordinators reported good relations among industry members regarding high trust, low tension, not a lot of competition, and frequent contact.
- Respondents were equivocal on the extent that industry works together to develop voluntary programs to help promote the management and development of the aquaculture industry.
- Nearly all respondents indicated that there are few to no aquaculture labor unions across the states.

Table 4. Industry Relations

Question: The following questions are meant to capture the dynamics of the aquaculture industry. Please indicate how much you agree or disagree with each of the following statements (N=27-28).

Response Options	Strongly disagree (-2)	Mildly disagree (-1)	Neutral (0)	Mildly agree (1)	Strongly agree (2)	Mean
a. There is a lot of tension between farmers who have been practicing aquaculture for a long time and those who have newly entered the industry.	53.6%	25.0%	14.3%	0.0%	7.1%	-1.1
b. Industry members often share their knowledge of the scientific/technical aspects of aquaculture with one another.	7.1%	3.6%	17.9%	42.9%	28.6%	.8
c. Industry members often share their knowledge of the regulatory/administrative aspects of aquaculture with one another.	3.6%	7.1%	14.3%	50.0%	25.0%	.9
d. Industry members are very competitive and rarely share knowledge with one another.	17.9%	46.4%	21.4%	7.1%	7.1%	-.6
e. Industry members exhibit a high level of trust and cooperation.	3.6%	17.9%	28.6%	35.7%	14.3%	.4
f. Due to resource constraints (limited land, water, etc.), industry members are forced to be competitive and carefully monitor each others' activities.	32.1%	39.3%	17.9%	7.1%	3.6%	-.9
g. Due to a competitive economic environment, industry members carefully monitor each others' activities.	25.0%	32.1%	25.0%	14.3%	3.6%	-.6
h. Industry members rarely come into contact with one another.	57.1%	21.4%	10.7%	3.6%	7.1%	-1.2
i. The industry works together to develop voluntary programs to help promote the management and development of the aquaculture industry.	14.3%	17.9%	21.4%	32.1%	14.3%	.2
j. There are strong aquaculture industry labor unions in the State.	96.3%	3.7%	0.0%	0.0%	0.0%	-2.0

Objective 2: Map the regulatory landscape within each of the states, including, looking at issues of regulatory stringency, monitoring and enforcement of regulations, compliance, and the relationship between state and non-state actors in shaping aquaculture regulations and policy.

To gain insight regarding characteristics of regulations across the United States, respondents were asked a series of questions about regulations, permits, compliance, and monitoring and enforcement.

REGULATIONS

The first set of questions focused on regulations. Table 5 provides a breakdown of the responses to these questions, indicating the percent of respondents that chose each response, as well as the mean scores across all respondents for each of these questions. For this series of questions, the number of respondents varied from 25-29.

Overall, the results indicate:

- Respondents were equivocal when asked if their state regulations were stringent with 48% agreeing and 41% disagreeing.
- Only 24% of respondents perceived their state regulations as (1) having severe penalties; and (2) being outdated and no longer appropriate.
- No respondents agreed that regulations do not exist in their state.
- More than 50% of respondents agreed that regulations were at least somewhat to fairly clear in describing those activities that are allowed and forbidden.
- More than 50% of respondents disagreed or were neutral on whether regulations allowed for a lot of discretion in interpretation.

Table 5. Regulation Characteristics

Question: Please indicate how much you agree or disagree with each of the following statements regarding regulations in your state (N=25-29).

Response Options	Strongly disagree (-2)	Mildly disagree (-1)	Neutral (0)	Mildly agree (1)	Strongly agree (2)	Mean
a. State regulations are very stringent in requirement and control.	17.2%	24.1%	10.3%	27.6%	20.7%	.1
b. State regulations are very clear and understandable in describing the activities that are allowed and forbidden.	13.8%	20.7%	13.8%	24.1%	27.6%	.3
c. State regulations contain severe penalties for people who do not comply with them.	13.8%	20.7%	41.4%	17.2%	6.9%	-.2
d. State regulations are meant to give a lot of discretion to individuals interpreting them.	20.7%	20.7%	37.9%	20.7%	0.0%	-.4
e. State regulations are outdated and no longer are appropriate for governing aquaculture in the state.	24.1%	27.6%	24.1%	17.2%	6.9%	-.5
f. Do not exist.	84.0%	0.0%	8.0%	0.0%	8.0%	-1.5

PERMITS AND PERMITTING PROCESS

The next set of questions dealt specifically with aquaculture permits and the permitting process. Table 6 provides a breakdown of the responses to these questions, indicating the percent of respondents that chose each response, as well as the mean scores across all respondents for each of these questions. For this series of questions, the number of respondents varied from 28-29.

Table 6. Permits and Permitting Process Characteristics

Question: Please indicate how much you agree or disagree with each of the following statements regarding permits in your state (N=28-29).

Response Options	Strongly disagree (-2)	Mildly disagree (-1)	Neutral (0)	Mildly agree (1)	Strongly agree (2)	Mean
a. It is too expensive to obtain aquaculture permits.	58.6%	24.1%	6.9%	6.9%	3.4%	-1.3%
b. There is too much paperwork required to obtain aquaculture permits.	41.4%	20.7%	10.3%	20.7%	6.9%	-.7%
c. The permitting process is very fragmented (i.e. many agencies involved).	37.9%	10.3%	3.4%	17.2%	31.0%	-.1%
d. The permitting process is so complex that it prevents people from entering the aquaculture industry.	44.8%	10.3%	17.2%	6.9%	20.7%	-.5%
e. The permitting process is so complex that individuals will conduct aquaculture without obtaining necessary permits.	51.7%	27.6%	3.4%	6.9%	10.3%	-1.0%
f. More permits are needed to adequately regulate the aquaculture industry.	58.6%	17.2%	10.3%	6.9%	6.9%	-1.1%
g. No permits for aquaculture are required in my state.	85.7%	3.6%	3.6%	0.0%	7.1%	-1.6%

In general, the results from Table 6 indicate:

- Nearly all respondents (>85%) indicated that permits were required in their states.
- More than 60% of respondents disagreed (1) that the permitting process was too expensive; (2) that the permitting process was so complex that individuals will conduct aquaculture without permits or

not enter the industry at all; (3) that more permits were required; and (4) that there was too much paper work.
- Respondents were equivocal that the permitting process was very fragmented (i.e. many agencies involved).

MONITORING AND ENFORCEMENT

Respondents were asked to indicate if their state has monitoring and enforcement systems in place for ensuring compliance with aquaculture related regulations. Of the 26 individuals that responded to this question, 23 (88.5%) said their states do have monitoring and enforcement systems in place and 3 (11.5%) said they do not.

In addition, respondents were asked to indicate the extent to which the government conducts monitoring and enforcement relating to compliance with aquaculture regulations and the extent to which community members (i.e. members of the industry) engage in such behaviors. Responses were categorized on a scale from 0-4, with 0 being no enforcement and 4 being heavy monitoring and enforcement. 28 individuals responded to the question. Overall, the results indicate that the government conducts moderate to significant enforcement of aquaculture regulations in most cases and community members conduct none to moderate enforcement in the majority of cases.

Figures 2 and 3 provide a breakdown of responses for each state.

Figure 2. Government Monitoring and Enforcement (N=28)

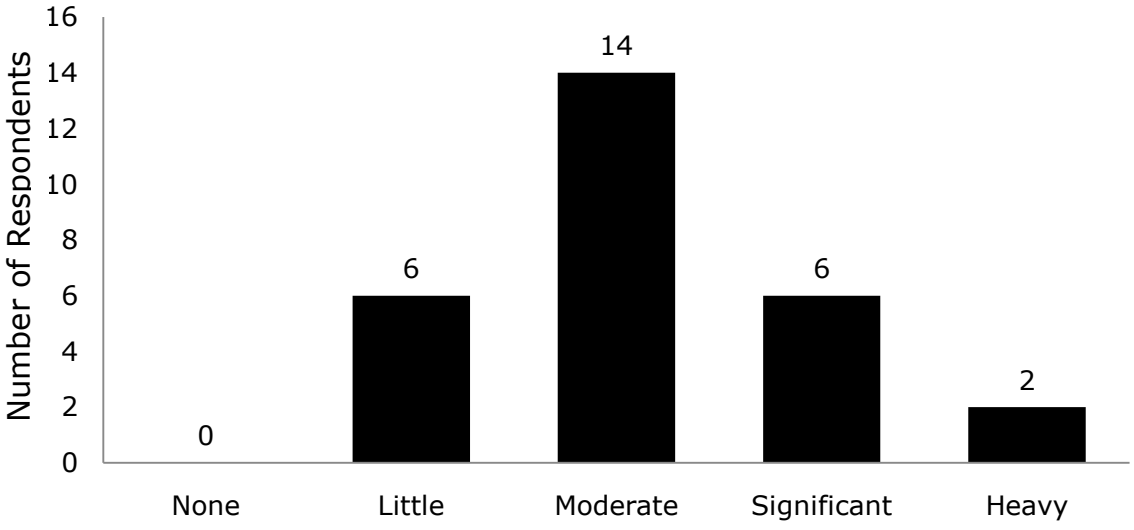
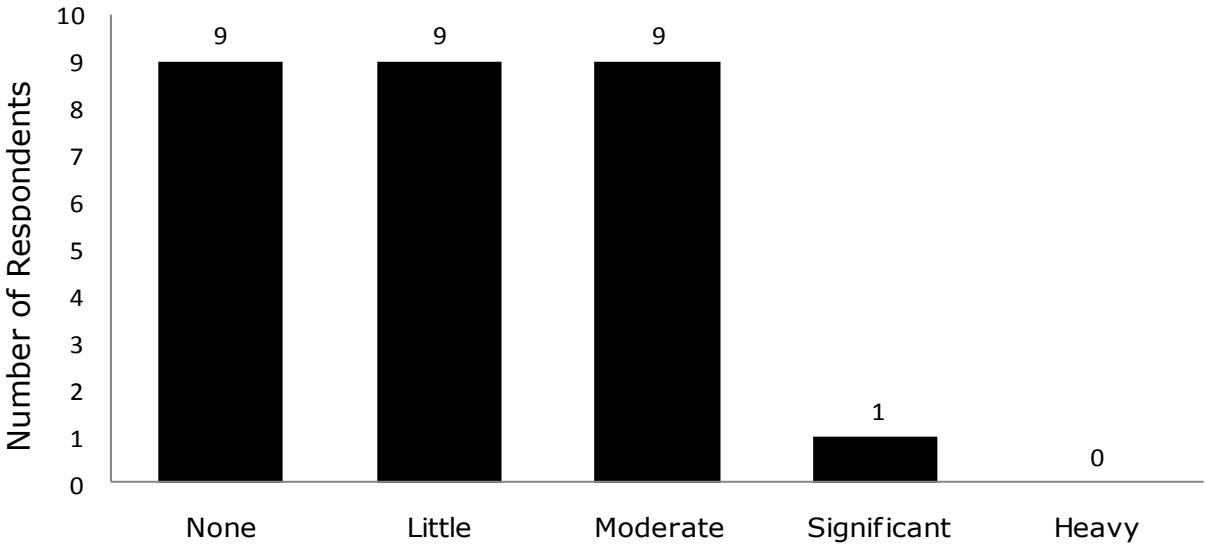


Figure 3. Community Monitoring and Enforcement (N=28)



COMPLIANCE

Respondents were asked a series of questions regarding compliance with aquaculture regulations in their state. For the 28 individuals who responded to these questions, Tables 7 and 8 provide a breakdown of their responses by indicating the percent that chose each category of response, as well as the mean scores for each of these questions.

Overall, the results indicate:

- More than 70% agreed that compliance was high in their state.
- Respondents disagreed mildly that compliance with aquaculture regulations varied from year to year.
- Non-compliance was most likely to be identified by government agencies (46% agreeing), followed by the public (17% agreeing), and finally by members of the industry (11% agreeing).

Respondents were also asked to identify the primary factors that contribute to compliance with aquaculture regulations in their state. Those factors that were listed as the most and least likely to contribute to compliance based on the mean response for each are listed below:

Factors most contributing to compliance include:

1. Trust and cooperation among industry members (mean response = 2.2).

2. Clear and well-defined regulations (mean response = 2.0).
3. Industry members feel regulations are scientifically and technically appropriate (mean response = 1.9).

Factors not contributing or contributing only mildly to compliance include:

- Guilt or shame associated with non-compliance with regulations (mean response = .7).
- Strong penalties for non-compliance (mean response = 1.2).

Table 7. Compliance Characteristics

Question: Please indicate how much you agree or disagree with each of the following statements regarding compliance with aquaculture regulations in your state (N=28).

Response Options	Strongly disagree (-2)	Mildly disagree (-1)	Neutral (0)	Mildly agree (1)	Strongly agree (2)	Mean
a. Compliance with aquaculture regulations is very high.	0.0%	10.7%	14.3%	39.3%	35.7%	1.0
b. Compliance with aquaculture regulations varies from year to year.	17.9%	28.6%	21.4%	21.4%	10.7%	-.2
c. Most non-compliance is identified by government agencies.	14.3%	14.3%	25.0%	39.3%	7.1%	.1
d. Most non-compliance is reported to governmental agencies by the public.	28.6%	28.6%	25.0%	14.3%	3.6%	-.6
e. Most-non-compliance is reported to governmental agencies by other members of the industry.	25.0%	25.0%	39.3%	3.6%	7.1%	-.5

Table 8. Contributors to Compliance

Question: Please indicate which of the following you feel are the primary contributors to compliance with aquaculture regulations in your state (N=28).

Response Options	Not a contributor (0)	Mild contributor (1)	Moderate contributor (2)	Significant contributor (3)	Biggest contributor (4)	Mean
a. Clear and well-defined regulations.	21.4%	21.4%	10.7%	17.9%	25.0%	2.0
b. Strong penalties for non-compliance.	32.1%	28.6%	28.6%	7.1%	3.6%	1.2
c. Trust and cooperation among industry members.	10.7%	21.4%	21.4%	28.6%	17.9%	2.2
d. Industry members feel regulations are scientifically and technically appropriate.	17.9%	25.0%	25.0%	14.3%	17.9%	1.9
e. Industry members feel that those enforcing regulations are competent.	21.4%	28.6%	25.0%	14.3%	10.7%	1.6
f. Industry members feel that regulations are fairly and consistently enforced.	14.3%	42.9%	10.7%	21.4%	10.7%	1.7
g. Industry members trust those monitoring and enforcing regulations.	17.9%	42.9%	17.9%	10.7%	10.7%	1.5
h. Industry members comply because they do not want to be perceived negatively by other community members.	32.1%	21.4%	21.4%	17.9%	7.1%	1.4
i. Industry members comply because it makes them feel guilty and ashamed not to.	57.1%	25.0%	3.6%	7.1%	3.6%	.7

Objective 3: Identify perceptions of aquaculture related problems in the different states, challenges to the involvement of the aquaculture community at the state level, and identify ways in which state aquaculture communities have effectively addressed challenges.

To address the third objective of this study, survey respondents were asked to identify what they perceive to be the most significant barriers to aquaculture development and strategies that members of the industry have used to overcome barriers to aquaculture development in their respective states. Interviewees were further asked to indicate the level of government, public and interest group support of aquaculture in their respective states as well as challenges to the involvement of the aquaculture community at the state level. A summary of both sets of responses is provided in this section.

BARRIERS TO AQUACULTURE DEVELOPMENT

Respondents were asked to indicate which of the following posed the most significant barriers to aquaculture development in their state on a scale from 0-4, with 0 being not a barrier at all and 4 being the largest barrier. Listed barriers included input costs (land prices, labor, and material costs), start up costs (capital investments, application fees, obtaining leases), resource constraints (water scarcity, land availability, energy), stringent environmental protection regulations and safeguards, complicated regulatory process associated with obtaining permits, licenses, etc., general public resistance to aquaculture development, cohesiveness or cooperation among industry members, foreign competition, domestic competition, current economic downturn, inexperienced farmers, and local user conflicts (recreational users, commercial fishers).

Of these barriers, those that were listed as being the most and least significant across the states are provided below.

Most Significant Barriers to Aquaculture Development:

- Start up costs (capital investments, application fees, obtaining leases).
- Input costs (land prices, labor, and material costs).
- Resource constraints (water scarcity, land availability, energy).
- Stringent environmental protection regulations and safeguards.

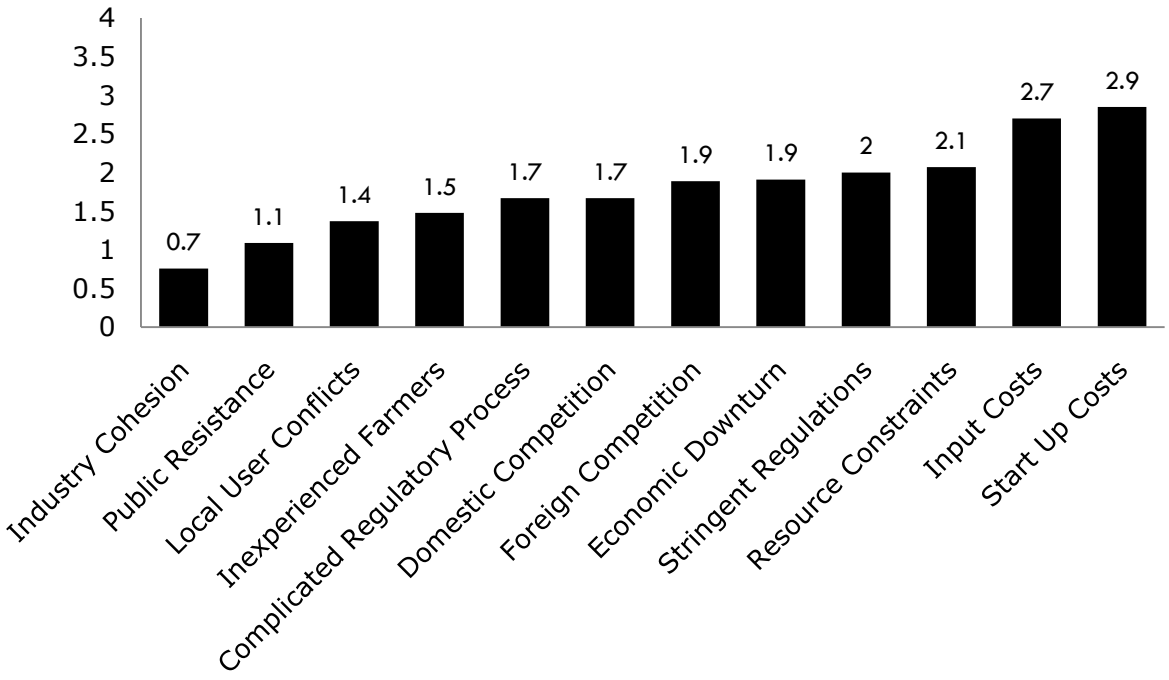
Least Significant Barriers to Aquaculture Development:

- Cohesiveness or cooperation among industry members.

- General public resistance to aquaculture development.
- Local user conflicts (recreational users, commercial fishers).
- Inexperienced farmers.

Figure 4 displays the mean responses for each barrier.

Figure 4. Mean Response for Barriers to Aquaculture Development (N=27)



GOVERNMENT, PUBLIC, AND INTEREST GROUP SUPPORT OF AQUACULTURE

The following sections include responses from the interviews as well as open ended questions posed in the survey.

In the interviews, participants were asked to describe a series of broader political questions relating to the support of and/or challenges to aquaculture development by the government, the general public, and interest groups.

Table 9 provides example responses for this set of interview questions.

Table 9. Interview Responses Regarding Government, Public, and Interest Group Support and Challenges to Aquaculture Development

Question [Government]: What is the level of state governmental support of aquaculture in your State?

Question [General Public]: How supportive is the general public of aquaculture in your State?

Question: [Interest Groups]: Has there been opposition to aquaculture development by interest groups?

Government Support	General Public	Interest Group
• "No subsidies. Decent amount of research before the economic downturn. State support of Universities, but no money for research aside from that in the last year and half." • "Politically, while there has been some legislation there is currently no one person who has led the efforts." • "Department of Agriculture Marketing Initiative." • "Some key people that are very supportive and other people are un-informed or misinformed. Need to educate these people and clarify misconceptions."	• "Generally neutral…in certain areas very supportive and in more urban areas there can be a fair amount of opposition. Opposition is localized." • "Range of feelings depending on who you talk to – Monterrey Bay Aquarium like shellfish and don't like salmon, for example. A lot of variability when it comes to public perception regarding aquaculture." • "People are more and more aware of the aquaculture industry (especially younger generations who are looking for healthier food options, local products, etc.)."	• "NGOs – Depending on the issue [can pose opposition]." • "There have been a variety of groups – including the Environmental Defense Fund and the Food and Water Watch (which is against the development of aquaculture all together) [that have posed opposition to aquaculture development]." • "Neighbors and commercial fisherman [can pose opposition]."

CHALLENGES TO THE INVOLVEMENT OF THE AQUACULTURE INDUSTRY AT THE STATE LEVEL

Interviewees were also asked to describe challenges to the involvement of the aquaculture industry at the state level. Below are examples of responses provided by interview participants:

- "Where they [industry members] haven't been so active is in working with the State Legislature to find a champion."
- "It can be challenging for industry people to get involved at the state level, but it is not impossible. The industry can be involved at the state level through the aquaculture advisory council or the shellfish advisory council."
- "Small industry – small voice."
- "Bickering industry associations – when they get involved like this, they look weak."

INDUSTRY STRATEGIES TO OVERCOME BARRIERS TO AQUACULTURE DEVELOPMENT

Survey respondents were asked to indicate how often the industry has used a variety of strategies to overcome barriers to aquaculture development on scale from 0-4, with 0 being never and 4 being daily.

Table 10 provides a breakdown of the responses to these questions, indicating the percent of respondents that chose each response, as well as the mean scores across all respondents for each of these questions. For this series of questions, the number of respondents was 27.

Overall, the results indicate that in dealing with barriers to aquaculture development:

- Nearly 90% of all respondents indicated that the industry engages in any of the activities monthly or daily.
- The most frequently engaged activity is coordinating activities among allies to convince decision makers to adopt industry positions.
- The most unlikely activity for industry is to use or hire experts to refute opponents' claims or to develop defensible positions.

Interviewees were also asked to describe which strategies has/does the industry use to overcome barriers to aquaculture development. The following strategies were described by interview participants:

- "Use of scientific data."
- "They [industry members] try to preserve what they have through various legal processes."
- "For shellfish farming, pointing out that it is very environmentally friendly. For marine finfish, pointing to reduction in global fish supply;

highlighting food quality/contamination concerns regarding imported fish."

- "Depending on the particular issue, people can work through the various aquaculture-related councils to deal with issues."
- "Agencies try to promote the benefits of aquaculture."
- "Usually put together a team of people to deal with a problem issue – leadership for these groups is usually provided through the University."
- "If there is ever an issue, they [industry members] like to sit down with the concerned parties and discuss like the gentlemen they are."
- "A whole variety of ways – one example was through community engagement with affected parties."

Table 10. Industry Strategies to Overcome Barriers to Aquaculture Development

Question: In the last five years, please indicate how often the industry has used the following strategies to overcome barriers to aquaculture development (N=27).

Response Options	Never (0)	Less than yearly (1)	Yearly (2)	Monthly (3)	Daily (4)	Mean
a. Sought legislative support.	3.7%	51.9%	37.0%	3.7%	3.7%	1.5
b. Engaged in publicity/marketing to change perceptions regarding aquaculture.	14.8%	51.9%	25.9%	3.7%	3.7%	1.3
c. Coordinated activities among allies to convince decision makers to adopt industry position.	7.4%	37.0%	44.4%	11.1%	0.0%	1.6
d. Used and/or hired experts to refute opponents' claims.	44.4%	48.1%	7.4%	0.0%	0.0%	.6
e. Used and/or hired experts to develop defensible positions.	44.4%	40.7%	11.1%	3.7%	0.0%	.7
f. Negotiated with opponents to produce consensus.	25.9%	37.0%	33.3%	3.7%	0.0%	1.1
g. Influenced the composition of aquaculture-related advisory committees.	29.6%	33.3%	25.9%	11.1%	0.0%	1.2

Objective 4: Examine the role of NASAC in providing resources and information to State Coordinators as well as the role of NASAC and State Coordinators in helping the industry achieve administrative and political goals.

To address objective 4, respondents were asked a series of questions relating to the role of NASAC and State Coordinators in the development of the aquaculture industry.

VIEWS ON THE NATIONAL ASSOCIATION OF STATE AQUACULTURE COORDINATORS (NASAC)

Survey respondents were asked a number of questions to assess the effectiveness of NASAC in meeting the organization's responsibilities and mission relating to the development of the aquaculture industry in the U.S. Table 11 provides a breakdown of the responses to these questions, indicating the percent of respondents that chose each response, as well as the mean scores across all respondents for each of these questions. For this series of questions, the number of respondents was 28.

Overall, the results from Table 11 indicate:

- More than 60% of respondents felt that NASAC has (1) effectively promoted, encouraged, and assisted the development of aquaculture in the United States and (2) benefited the aquaculture industry in their state.
- NASAC received its lowest rating with 38% of respondents disagreeing that NASAC helped the industry in their state reach administrative and political goals.
- More than 90% were neutral or agreed that NASAC has effectively addressed the breadth of aquaculture issues facing the aquaculture industry.
- Respondents showed weak agreement (46%) that NASAC helps them coordinate aquaculture programs in their state.

Table 11. Respondent Views of the National Association of State Aquaculture Coordinators (NASAC)

Question: Regarding the role of the National Association of State Aquaculture Coordinators (NASAC) in your state, please indicate how much you agree or disagree with each of the following statements (N=28).

Response Options	Strongly disagree (-2)	Mildly disagree (-1)	Neutral (0)	Mildly agree (+1)	Strongly agree (+2)	Mean
a. The NASAC helps me coordinate aquaculture programs in my state.	7.1%	25.0%	21.4%	32.1%	14.3%	.2
b. The NASAC provides a unified political voice for state industries at the national level.	3.6%	10.7%	17.9%	35.7%	32.1%	.8
c. The NASAC has helped the industry in my state reach administrative and political goals.	10.7%	28.6%	39.3%	14.3%	7.1%	-.2
d. The NASAC has effectively promoted, encouraged, and assisted the development of aquaculture in the United States.	0.0%	0.0%	25.0%	60.7%	14.3%	.9
e. The NASAC has effectively addressed the breadth of aquaculture issues facing the aquaculture industry.	0.0%	7.1%	42.9%	32.1%	17.9%	.6
f. Having an official State Aquaculture Coordinator has significantly benefited the aquaculture industry in my state.	7.1%	10.7%	21.4%	32.1%	28.6%	.6

In the survey, respondents were also asked to describe how they think NASAC could better serve the needs of State Aquaculture Coordinators. The following suggestions were provided by respondents:

1. "Perhaps a monthly e-mailed concise summary of the status of federal regulatory efforts on aquaculture would be helpful."
2. "Have more representation from states - many states are not members."
3. "The annual meetings are very important. One thing that is disappointing is the low attendance to the NASAC annual meetings (mostly due to budget). I hope that NASAC works on different strategies to help boost the attendance to the annual meetings."
4. "Better membership numbers to strengthen NASAC base; NASAC Members will work together and share."
5. "Lack of state funding for an aquaculture specialist/expert at the department of agriculture severely limits how much anyone can help the state aquaculture coordinator."
6. "Continue to be active in the political process."
7. "Maintain political relevancy among Commissioners, Secretaries, Directors (CSDs) (Executives of State Departments of Agriculture). Offer innovative assistance programs to states that do not contribute to encourage a stronger organization. Focus more on marine aquaculture and not at the expense of freshwater aquaculture."
8. "Increase activity and presence to enroll more members - increase national and state activity."
9. "Newsletter."
10. "Continue and expand the sharing of information and networking."
11. "Have regular communication with them [state aquaculture coordinators] via email or website but it is critical that the dialogue go both ways."
12. "Develop a better mechanism for sharing information on State/Regional/Local issues impacting the industry and how these issues are resolved by the respective State officials."
13. "Be more pro-active in marketing national aquaculture as a whole and inclusive of marine and off shore opportunities and promote one aquaculture voice. Assist in educating the public and government officials that state hatcheries and stocking programs are aquaculture."

In the interviews, participants were asked to describe the role that NASAC plays in providing resources and information to state aquaculture coordinators to address aquaculture related issues. The following comments are example responses provided by interviewees:

- "NASAC is a conduit with which they [state aquaculture coordinators] can provide or get information about other states. Because they have

people who want to ship between states, NASAC provides a way to identify a point person or provide contacts to farmers."

- "Allows people to understand what is going on in other states – Ex. Knowing what it is like to have an aquaculture coordinator. Compare regulations and legislation between states. Provides network for different types of expertise. Invasive and non-native species information. Good source of information and expertise. Group sends out items of interest to aquaculture groups. Lobbying national legislature based on Coordinator input – indirect way to have a political voice."

- "NASAC provides information and resources to NASAC members through their newsletter and directories to keep people up to speed on important aquaculture issues and what is going on in different states."

- "Association is a great resource for knowing what is going on in other places."

- "If you are looking at state government representatives, then it provides networking and resource sharing opportunities. Information exchange among colleagues facing similar problems. There are also possibilities for people working together (new genetic information, nutritional information, etc.)."

Also in the interviews, participants were asked to describe the role NASAC and State Coordinators played in helping the aquaculture industry achieve its administrative and political goals. The following comments are example responses provided by interviewees:

- "They have been a consolidated voice that can stand up and give a unified position on regulatory issues."

- "Providing information and expertise. Most aquaculture departments in the State are quite small and are limited in terms of resources. Expands the network of people helping you with the issues."

- "NASAC maintains a list of contacts for coordinator members so people know who to contact regarding different issues."

- "The people who are currently members usually have so much to do that they can't step out into the national arena. Many Coordinators don't have much power within their own organizations to work on political issues."

SECTION 3: CONCLUSIONS

This study was guided by four objectives. The findings for each are listed below.

Objective 1. Identify how various groups within the aquaculture community are networking with one another.

The results indicate very positive relations among aquaculture industry members with frequent information sharing on scientific/technical issues as well as regulatory/administrative issues. A majority of respondents also perceived high trust, low tension, not a lot of competition, and frequent contact among industry members. Information flows among members indicate frequent exchanges between state aquaculture coordinators and industry members. Information flows were the fewest between state coordinators and national-level actors.

Objective 2. Map the regulatory landscape within each of the states, including, looking at issues of regulatory stringency, monitoring and enforcement of regulations, compliance, and the relationship between state and non-state actors in shaping aquaculture regulations and policy.

Responding state aquaculture coordinators showed support for the regulatory landscape overall.

Respondents were equivocal about the degree of regulatory stringency in their state. A strong majority did not view their state regulations as having severe penalties or being outdated. They also perceived regulations as being somewhat to fairly clear. The permitting process was not perceived as a problem. Most disagreed that the permitting process was too expensive and too complex that individuals will conduct aquaculture without permits or not enter the industry at all. Respondents also did not feel that more permits were required and that there was too much paper work associated with the permitting process.

While most monitoring and enforcement is conducted by government and not by industry, a large majority agreed that compliance was high in their state with the most influential factors contributing to compliance being trust and cooperation among industry members, clear well-defined regulations, and regulations that are scientifically and technically appropriate. Guilt, shame, and strong penalties were not factors perceived as major contributing factors for compliance.

Objective 3. Identify perceptions of aquaculture related problems in the different states, challenges to the involvement of the aquaculture community at the state level, and identify ways in which state aquaculture communities have effectively addressed challenges.

Respondents identified a number of barriers inhibiting aquaculture development in their states. The most significant barriers to aquaculture development were start up costs, input costs, resource constraints, and stringent environmental protection regulations and safeguards. The least significant barriers to aquaculture development were cohesiveness or cooperation among industry members, general public resistance to aquaculture development, local user conflicts (recreational users, commercial fishers), and inexperienced farmers.

Objective 4. Examine the role of NASAC in providing resources and information to state coordinators as well as the role of NASAC and state coordinators in helping the industry achieve administrative and political goals.

Responding state aquaculture coordinators generally rated NASAC affirmatively. They perceive NASAC as being effective in promoting, encouraging, and assisting the development of aquaculture in the United States. Some respondents felt that NASAC could more effectively help the industry in their state reach administrative and political goals.

From this study, we offer some strategies for NASAC leaders and members to consider:

1. Continue current activities that promote and encourage aquaculture in the United States by maintaining a consolidated voice and in offering administrative and political support to state aquaculture coordinators.
2. Maintain and improve communication channels of activities in other states and encourage diffusion of both innovations and failures.
3. Continue to serve as the liaison between state-level coordinators and national-level organizations. In this effort, develop a long-term strategy for creating a stronger national position that transcends each individual state to influence national aquaculture development.
4. Consider outreach to the states not responding to this survey; it could indicate lack of involvement or low satisfaction with NASAC.
5. Given limited resources within each state, develop a long-term strategy for supporting political efforts within and across states. This might include organizing and coordinating a team of experts and advisors to aid industry across states in their political efforts.

6. Capitalize on the positive relations among aquaculture community members in mobilizing support for the aquaculture industry within states and at the national level.
7. Respondents request more frequent interactions and meetings with higher attendance. Develop alternate strategies for possibly more frequent meetings that circumvent budget cuts (e.g. web conferences).

Drawing conclusions with confidence from any study requires some caution. Readers should temper their confidence by the limited sample. While this study adhered to the techniques for maximizing response rate, a sizable portion of the sample still did not respond. Approximately 57% of the population of state aquaculture coordinators responded to the survey leaving nearly 1/3 not responding. We can only speculate the reasoning for the non-respondents. State aquaculture could be distracted by the furloughs and the state budget cuts; they may have been confused with another parallel study conducted by the UC Denver research team on aquaculture partnerships, and/or the low response rate could signify a lack of interest in NASAC among some state representatives. Whatever the reason, if this study were repeated, we recommend the initial interviews involve some of the state aquaculture coordinators in the non-responding states.

Another limitation involves the content of the survey instrument. In this study, the survey instrument was developed and revised over time by the UC Denver researchers and the NASAC representatives. Still, some survey items proved to be more useful than others. If this study were repeated, we recommend, for example, that the next survey include "Fish/Shellfish Culture" as a response option for the competency question, "NASAC" as a response option for organizations most involved in the governance of aquaculture, and that an additional survey question be added that addresses challenges relating to the involvement of the aquaculture community at the state level. The latter was only asked in the interviews. We also recommend a focused set of questions about the ways in which NASAC has and has not helped the political situations for the aquaculture industries in each state.

Despite these limitations, this is probably the most comprehensive attempt to understand the state of aquaculture policies and regulations and the role of NASAC across the United States. The strengths of this study entail the multiple methods of data collection (both interviews and surveys) and the collaboration between NASAC and UC Denver.

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