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Title

Rules and Decision Making: Assessing Compliance through an Institutional Lens

Abstract

In this paper, the Institutional Analysis and Development (IAD) framework is applied to organize an inquiry of regulatory compliance motivations. Compliance motivations are examined using questionnaire and interview data collected among members of the aquaculture community in Florida State. The findings indicate that regulatees are more likely to comply with regulations (1) when they perceive enforcement personnel as being knowledgeable; (2) when they have a desire to maintain a good reputation with their peers; and (3) when they possess a strong sense of guilt associated with non-compliance. This paper contributes to an understanding of compliance motivations in two ways; first, by examining the relative influence of motivations emerging from regulatory, community, and individual contexts, and second, by applying an institutional framework that supports the complementary analysis of motivations associated with each of these different realms.

Keywords

compliance motivations, institutional analysis and development framework, aquaculture

Introduction

Over the past several decades, public policy scholars have sought to answer a cardinal governance question: what motivates regulatory compliance? In responding to this question, scholars have demonstrated the influence of a wide array of factors relating to characteristics of the regulatory environment (Bardach and Kagan, 1982; Gunningham et al., 2005; May, 2005), regulatory design (Ostrom, 1990; 2005; Gezelius, 2003; Hart, 1997), and individual and social contexts (Crawford and Ostrom, 1995; Grasmick and Bursik, 1990; Hatcher et al., 2000; Ryan and Deci, 2000; Sutinen and Kuperan; 1999). From this body of research, it is abundantly clear that understanding compliance behavior necessitates a concerted analysis of motivations relating to each of these different realms. That is, a complete understanding of compliance motivations can only be ascertained through analyses that take into account the physical, material, and normative parameters that influence behavioral choices. However, few studies have examined such factors in conjunction to ascertain their relative influence on shaping individual compliance (May, 2004; 2005; Gunningham et al., 2005). Part of the challenge associated with fashioning such an analysis is choosing which variables to include and exclude given the multifarious nature of compliance. As Etienne (2011) notes, “compliance theorists have struggled to build theories that would be internally consistent and at the same time capable of accounting for the simultaneous pursuit of motivations as heterogeneous as material, emotional, or normative goals” (Etienne, 2011, 106).

Where theoretical guidance is lacking, analytical frameworks may be instrumental in organizing diagnostic and prescriptive inquiry¹ (Ostrom, 2007, 25). Frameworks focus on identifying

¹ The author’s discussion is based on a distinction outlined by Ostrom (2005; 2007) between frameworks and theories. According to Ostrom (2005), “a general framework helps to identify the elements (and the relationships among those elements) that one needs to consider for institutions [i.e., rule-based] analysis....Theories focus on a framework and make specific assumptions that are necessary for an analyst to diagnose a phenomenon, explain its processes, and predict outcomes” (Ostrom, 2005, 28). Theories identify specific variables that are predicted to have a certain type of influence on the outcome variable(s) of analytical interest.

general relationships between *classes* of variables presumed to be important in affecting a particular outcome. According to Schlager (2007), “frameworks bound inquiry and direct the attention of the analyst to critical features of the social and physical landscape” (Schlager, 2007, 293). Because they are not as specific as theories, and thus are not subject to conceptual boundaries in the same ways that theories are, frameworks can offer useful analytic platforms where a particular outcome (e.g., compliance) is presumed to be influenced by a host of seemingly siloed factors (e.g., material, physical, normative).

In this paper, the institutional analysis and development (IAD) framework is applied to organize an empirical inquiry of compliance motivations, focusing specifically on the following questions: How do regulatory-based factors affect compliance? How do individual and community based factors affect compliance? What is the *relative* influence of regulatory, individual, and community based factors in affecting compliance? The IAD framework is well suited for an examination of these questions as it explicitly calls for the inclusion of classes of variables in one analytical lens that are presumed to influence compliance; including, rules, rule monitoring and enforcement characteristics, and individual and community attributes (Ostrom, 2005, 15). Within each of these classes of variables, specific variables are examined based upon findings in past IAD and regulatory scholarship; for example, the perceived appropriateness of regulatory scope, perceptions that enforcement personnel are competent, regulatees’ fear of facing financial penalties, desires to maintain a good reputation with fellow community members, and feelings of guilt associated with non-compliance.

The examination of compliance motivations is conducted in the context of aquaculture in Florida State using interview and questionnaire data. Aquaculture is defined as “the propagation and rearing of aquatic species in controlled or selected environments” (NOAA, 1980). Aquaculture has

become an increasingly salient state and national level policy issue as the industry continues to expand in response to depleting wild fish stocks (Naylor et al., 2000) and a seafood trade deficit that exceeds nine billion dollars (NOAA, 2009). The growth of the industry has been accompanied by new regulations, supporting regulatory structures, and industry entrants, as well as heightened public attention and scrutiny (Mazur and Curtis, 2006; Amberg and Hall, 2010). Aquaculture represents a theoretically interesting context within which to examine compliance motivations. It is characterized by increasing levels of state regulations while industry members have demonstrated a proclivity to develop community level best practices and norms. Given this context, aquaculture communities are an appropriate setting within which to analyze diverse compliance motivations, including those stemming from features of the regulatory environment as well as those that are individual and community based.

The subsequent sections will begin with a discussion of regulatory and IAD scholarship as is relevant for an understanding of compliance motivations, the relationships between the two literatures, and the emergent propositions that are explored in this paper. This discussion is followed by a description of the study setting and the interview and questionnaire instruments used to acquire data therein. The data analysis and results portions of the paper will describe the qualitative and quantitative techniques applied to interview and questionnaire data, respectively, and summarize findings from the interview, bivariate, and multivariate analyses. Based on these findings, it is concluded that regulatees are more likely to comply with regulations (1) when they perceive enforcement personnel as being knowledgeable; (2) when they have a desire to maintain a good reputation with their peers; and (3) when they possess a strong sense of guilt associated with non-compliance. The contribution of this analysis to the study of regulatory compliance is two-fold: First, the IAD framework is applied as a lens through which to examine a set of analytical variables that both complement and elaborate upon those studied within the regulatory scholarship. Second,

the findings lend empirical support to arguments regarding the ascendant role of normative over material compliance motivations.

Regulatory Scholarship and the Institutional Analysis and Development Framework

Regulatory scholarship, as it pertains to this study, is a body of empirical research that highlights variables important in shaping compliance behavior. Given the vast heterogeneity of factors demonstrated to affect compliance, no single theory of regulatory compliance has yet been developed (Etienne, 2011). It is evident, however, that there are certain categories of factors that influence regulatory compliance; for example, characteristics of regulatory design and regulatory enforcement. Further, that factors belonging to each of these categories must be analyzed concurrently to gain a comprehensive understanding of compliance behavior. In deciding which categories and specific variables are necessary to include in a concerted analysis, one needs an approach for organizing a systematic inquiry of them.

The IAD framework is applied in this paper to illuminate one way to organize an inquiry of compliance motivations as it explicitly calls for the inclusion of variable classes relevant for an understanding of regulatory compliance. The IAD framework is useful for providing an inclusive and systematic examination of the principal analytical components relating to an understanding of behavior in rule-governed contexts. It offers a conceptual map and systematic analytical approach for understanding how “rules [both those codified in formal documents, such as regulations, and those that are reflected in social norms] affect the incentives confronting individuals and their resultant behavior” (Ostrom, 2005, 8-9). Incentives are expected to be internalized variably by actors whose mental models are affected by “feedback from the world and the shared culture or belief system in which an individual is embedded” (Ostrom, 2005, 105). At the framework level, it is thus appropriate for identifying variables of interest when pursuing a systematic investigation of the

influences that undergird individuals' behavioral choices, pointing specifically to those emerging from regulatory design, individual, and community contexts.

Because the IAD framework offers limited theoretical guidance about the relationship between these types of variables, however, regulatory and IAD scholarship are applied in conjunction herein to gain a thorough depiction of factors that shape decision making regarding compliance and the expected directionality of this influence (i.e., positive or negative influence on compliance). In particular, this analysis will explore the influence of two sets of motivations on compliance: regulatory-based motivations (e.g., characteristics regulatory design and monitoring and enforcement) and individual and community based motivations (e.g., feelings of guilt associated with non-compliance or compliance based on social reputational concerns). The following discussion highlights the specific variables that will be examined in each of these two categories of factors based on past empirical research, and offers propositions relating each to compliance.

Regulatory Scholarship

Early research on compliance was steeped in the belief that a fear of penalty or punishment was a primary compliance motivator (Bentham, 1789) and relied heavily on the regulatory deterrence model (Becker, 1968). This model is premised upon the assumption that legal sanctions suffice to thwart the desire for non-compliance on the part of regulated actors. Consistent with the rational actor model of the individual, regulated actors from this perspective are considered self-utility maximizing agents in which the incentive to accumulate profit, or conversely, to not bear excessive costs, is the sole motivator guiding individuals' decision making processes. As such, monetary sanctions administered through regulatory agencies are viewed as the primary coercive mechanism for fostering regulatory compliance (Becker, 1968; Zimring and Hawkins, 1973).

Increasingly, empirical research in the regulatory field has drawn upon scholarship from sociology and social psychology to demonstrate that a variety of other factors stemming from

individual and community contexts contribute to regulatees' decisions regarding when to comply with regulatory directives apart from monetary considerations (Elster, 1989a; Elster, 1989b; Coleman, 1990; Ajzen, 1988). Such factors include social sanctions and influence (Hatcher et al., 2003; Sutinen and Kuperan, 1999), feelings of shame or guilt (Grasmick and Bursik, 1990), and the extent to which individuals express a moral obligation to comply with the law (Hatcher et al., 2000; Gezelius, 2003, Kuperan and Sutinen, 1995). Hatcher et al. (2000), for example, found that social pressures served as an effective deterrent to non-compliance relating to catch quotas, or individual fishing quotas, in the United Kingdom. Similarly, Kuperan and Sutinen (1995) have explored the relationship between compliance and feelings of moral obligation among regulatees regarding fishery zoning regulations in Malaysia.

Looking to other motivating factors, scholars have also examined a host of variables specific to a particular regulatory context, including: enforcement practices, specifically frequency of inspections (Burby and Paterson, 1993; Gray and Scholz, 1993; Helland, 1998; May, 2005), belief congruency between regulators and regulatees regarding the way the industry should be managed (May, 2005; Bardach and Kagan, 1982), technical competence of the regulatory agency as perceived by members of the industry (Bardach and Kagan, 1982), and the presence of trust between the two actors (Scholz and Lubell, 1998). Of these, an important factor that will be analyzed in this paper is the extent to which regulatees feel that those enforcing regulations are competent or knowledgeable (Bardach and Kagan, 1982) as this has not been studied as widely as the other aforementioned factors. Where they are not, regulatees may question the legitimacy of rules or the ability of enforcement personnel to administer those rules (Gunningham et al. 2005).

Another vein of regulatory scholarship based in a more socio-legal tradition focuses on the relationship between regulatory content and compliance (Gezelius, 2003; Hart, 1997). In what he terms "legitimacy of the law," Gezelius (2003) builds upon the work of Hart (1997) to explore the

relationship between “formal norms” and “informal norms” and the implications of this relationship on compliance. Gezelius and Hart define “formal norms” as the government created laws that “require people to act in certain ways or abstain from certain actions” (Hart, 1997, 81). In contrast, “informal norms” are norms guiding behavior that emerge from “citizens’ inter-subjective experience,” independent of externally imposed laws or regulations. Legal legitimacy, according to Gezelius, is the extent to which formal and informal norms are consistent and is a factor shaping individual compliance. A paucity of research in this area by regulatory scholars may be supplemented by IAD research wherein formal and informal norms have been extensively studied. Using an IAD lens to understand regulatory compliance can shed additional light on the role of formal and informal norms, or rules, in collective action situations (Ostrom, 1990; 2005).

The preceding discussion illustrates that compliance is heterogeneously motivated by factors relating to regulatory design, regulatory mechanisms (i.e., enforcement), as well as, normative considerations derived from actors’ individual and community experiences. However, many regulatory studies focus on variables belonging to one of these types of factors. Part of the reason for this may be that regulatory scholars have not yet identified theories of compliance that allow for the simultaneous consideration of diverse compliance motivations. The following section outlines one integrative approach that can be applied toward this endeavor.

Institutional Analysis and Development Framework

The institutional analysis and development (IAD) framework is used in this paper to organize a study of compliance motivations. The IAD framework provides a structured approach for understanding, first, the rules individuals develop to govern behavior, and second, what factors affect how individuals respond to these rules. Under the framework it is presumed that when confronted with a behavioral choice in a rule-governed context, boundedly rational actors will be influenced by (1) the structure of opportunities and constraints established in, and associated with,

formal and/or informal rules; (2) patterns of interaction between individuals being governed by and those monitoring and enforcing rules; and (3) individuals' psychological valuations of intrinsic and extrinsically derived motivations.

As frameworks are meant to identify general relationships between classes of variables rather than generating specific predictions about the expected patterns of these relationships (Ostrom, 2005,28), propositions offered in this paper regarding compliance motivations draw primarily from applications of Common Pool Resource (CPR) theory, housed within the IAD framework, as well as upon empirical regulatory studies. Under the IAD framework, rules are understood to be generated by actors within a specific context to structure their behaviors and participant roles and responsibilities. Ostrom et al. (1994) write that, "Rules are the result of implicit or explicit efforts to achieve order and predictability among humans by creating classes of persons (positions) who are then required, permitted, or forbidden to take classes of actions in relation to required, permitted, or forbidden states of the world" (Ostrom et al., 1994, 38). Compliance within the setting of the IAD framework is characterized as conformance with rules and is shaped by both individuals' normative and material considerations (Ostrom, 2005, 167) emerging from biophysical, community, and individual contexts. Compliance has been an important consideration for IAD scholars, particularly those applying CPR theory, to understand how communities develop rules so as to promote the successful management of common pool resources (Ostrom, 1990).

The IAD framework offers a useful analytical platform upon which to extend a discussion of the interplay between formal and informal norms as highlighted in the regulatory literature (Gezelius, 2003; Hart, 1997). Under the framework, rules codified into written documents such as policies, laws, or regulations are characterized as "rules-in-form." Rules-in-form are distinct from "rules-in-use," which are codified in social norms and customs. Rules-in-use may or may not be

embodied in rules-in-form². The extent to which they are, however, may enhance their perceived legitimacy (Ostrom, 2005) as found by scholars applying the IAD's CPR theory and Gezelius (2003). In other words, rules-in-form that reflect community or industry norms are expected to be better received by regulatees than those that are not. Where regulating and regulated actors possess disparate beliefs regarding how an industry should be managed, scholars argue that regulated agents may question the legitimacy of regulatory agents as well as the legitimacy and fairness of the directives themselves (Gezelius, 2003; May, 2005; Ostrom, 1990). This, in turn, may negatively impact compliance levels (May, 2005, 321; Bardach and Kagan, 1982; Levi, 1988).

According to CPR theory, consistency between rules-in-form and rules-in-use may be partly informed by the degree to which those being governed by a set of rules are participants in the rule development process (Ostrom, 1990) or the extent to which they regularly communicate with those charged with developing rules. Regulatory scholars Braithwaite et al. (2007) suggest that frequent communication between regulators and regulatees reduces the social distance between the two types of actors, thereby increasing the likelihood of compliance. According to Braithwaite et al., "In the regulatory context, social distance is a useful concept to explain the ways in which individuals place themselves beyond the reach and influence of an authority, so that they do not understand or hear the demands, and they do not fear the consequences of non-compliance" (Braithwaite et al., 2007, 138).

² "Rules-in-form" and "rules-in-use" may also be characterized as "institutions-in-form" and "institutions-in-use." At the broadest level, prescriptions for governing behavior within the IAD framework are characterized as "institutions," where these are defined as the "prescriptions that humans use to organize all forms of repetitive and structured interactions" (Ostrom, 2005, 3). Institutions are then characterized as rules, norms, or strategies based on the degree of enforcement and sanctioning specified within them for non-compliant behavior (Ostrom, 2005; Crawford and Ostrom, 1995). Irrespective of this distinction, however, IAD scholars often use the phrases "rules-in-form" and "rules-in-use" in discussing what would be perhaps more technically appropriate to refer to as "institutions-in-form" and "institutions-in-use."

A related factor highlighted in CPR applications as being an influential compliance determinant is the perceived appropriateness of rule (e.g., regulatory) scope, particularly in relation to local resource, political, and social conditions (Ostrom, 1990; 2005). Ostrom (1990) proffers that rules that are well-tailored to the context in which they are being applied contribute to the long term sustainability of such resources (Ostrom, 1990, 92). In exploring this issue within a fisheries context, Jentoft (2004) asserts that when fishers lose the ability to feel morally committed to “values such as honesty and respect for rules” (Jentoft, 2004, 144), the ascendancy of regulatory over regulated agents begins to diminish, thereby increasing chances of non-compliance by the latter. In the case of this paper, regulatory scope appropriateness is understood specifically in terms of the extent to which regulations accurately represent the array of activities that regulatees are involved in on a daily basis.

Another important dimension of rules is the way in which they are monitored and enforced. As Ostrom states, “It is obvious to most institutional analysts that rules must be enforced in some manner to achieve robust governance” (Ostrom, 2005, 265). In general, the IAD framework makes the case of context appropriateness; just as rules that are crafted in accordance with local resource, political, and social conditions are expected to foster compliance, so too are monitoring and enforcement mechanisms that reflect sensitivity to the rule-governed context. In CPR studies, this sensitivity has been operationalized as the inclusion of local regulatees in monitoring and enforcement efforts (Banana and Gombya-Ssembajjwe, 2000). Presumably, local regulatees possess both the tacit and rule-based knowledge necessary for effective monitoring and enforcement.

Finally, consistent with mental model debates in the regulatory scholarship, Crawford and Ostrom (1995; 2005) sought to examine the relative influence of intrinsic and extrinsically derived motivations on individuals’ decision making calculus concerning compliance within the purview of the IAD framework. Consistent with the underpinnings of the framework, Crawford and Ostrom

challenged rational choice institutional models that view actors as exhibiting static preferences and behavior solely as a product of externally provided constraints, information, and outcome possibilities, while neglecting socially, or community, derived motivations (McCay, 2002; Shepsle, 2006, 24-25). Instead, they argued that material and non-material rewards all factor into individuals' decision making processes. To demonstrate this tendency, they called for the analytical juxtaposition of factors based on material (e.g., fear of facing financial penalties) and non-material rewards and sanctions (e.g., feelings of guilt and fear of social disapproval associated with non-compliance). In furthering the analysis of these variables within the analytical context of the IAD framework, Speer (2010) examined the relative influence of a fear of financial penalties, fear of social disapproval, and feelings of guilt in influencing compliance among local government actors within the case of participatory governance arrangements in Guatemalan municipalities. She found that social enforcement of the law by members of civil society was necessary for local government compliance. Individual and community based compliance motivations such as those discussed here are consistent between the IAD and regulatory literatures as both consider the influence of the fear of monetary sanctions, peer pressure, and feelings of personal guilt or shame in influencing compliance outcomes (Frey, 1994; Bendor and Mookherjee, 1990; Crawford and Ostrom, 1995; Sutinen and Kueperan, 1999; Grasmick and Bursik, 1990)

The discussion presented up to this point is meant to demonstrate the multi-dimensional nature of compliance. Compliance is at least tied to factors relating to regulatory design, interactions between regulatory and regulated agents, and individual and community contexts. Based on this observation, it is argued that the IAD framework is an appropriate umbrella lens for assessing compliance as it designed to support an examination of individual and collective behavior within rule-governed contexts. The framework includes classes of variables that correspond to the major categories of factors found by regulatory scholars to affect compliance. Further, the tenets of the

framework are consistent with developments in compliance research, whereby scholars have increasingly come to acknowledge the influence of normatively-oriented factors.

Propositions

Building on past regulatory and IAD scholarship, the following eight compliance motivations will be examined in this paper. It is expected that each of these factors is positively associated with compliance: (1) the extent to which individuals feel that those enforcing regulations are knowledgeable; (2) the extent to which individuals feel that that regulations accurately reflect the scope of activities that they are engaged in on a daily basis; (3) whether or not regulations are perceived as being consistent with industry best practices; (4) whether or not individuals regularly communicate with members of regulating agencies concerning regulatory matters; (5) a fear of financial penalties; (6) a desire to maintain a good reputation with other industry members; (7) feelings of guilt associated with non-compliance; and (8) a strong moral obligation to produce a good product. The first four of these motivations are characterized as "regulatory based compliance motivations" as they pertain to features of the regulatory context, such as regulatory enforcement personnel and regulatory design. The latter four variables are characterized as "individual and community based motivations" as they are grounded in individuals' unique compliance considerations based on their individual and the community contexts. Table 1 summarizes propositions that are posited in this paper in relation to each of the aforementioned motivations and also specifies how these are characterized (i.e., regulatory or individual or community based).

Table 1 Here

Study Setting: Aquaculture in Florida

This assessment of factors contributing to compliance with state level aquaculture regulations was conducted in the State of Florida. The selection of Florida as an appropriate case

study to pursue this endeavor was based on data collected through a national study of members of the National Association of State Aquaculture Coordinators (NASAC) (survey n=32; interview n=10; survey response rate = 57%; states represented in study sample = 30). The purpose of the NASAC study was to collect information on the regulatory landscapes of aquaculture producing states, including, characteristics of state regulations (e.g. regulatory stringency), state regulatory mechanisms (e.g., arrangements for enforcement), compliance behavior (e.g., levels of regulatory compliance with state level regulations), and industry dynamics (e.g., extent of peer monitoring and enforcement among industry members).

The primary variable used for case selection purposes was farmer compliance with regulations. In the NASAC study regulatory compliance among Florida aquaculture producers was reportedly very high.³ In relation to the overall findings of the NASAC study, this makes Florida a typical case (Gerring, 2007). More than 70% of study respondents agreed that compliance with aquaculture regulations in their respective state is very high (Siddiki and Weible, 2010). At least with respect to compliance, the fact that it represents a typical case makes the findings from this single case study more amenable to generalization than if an outlier case study were examined.

³ Florida was selected as part of a comparative most-similar case study design in which two states were to be compared in a follow-up study assessing compliance factors (the results of which are presented in this paper). The two states selected were Florida and Virginia. Based on the NASAC data, these two states were reportedly similar in a number of regulatory and industry characteristics, but differed in terms of levels of regulatory stringency. Differentiating Florida and Virginia was that Florida was reported as having very stringent regulations while Virginia was reported to have non-stringent regulations. In pursuing this type of most-similar design, the author was interested in determining what factors contribute to reportedly high levels of regulatory compliance when regulatory designs apparently offer diverse incentives to comply. In states with stringent regulations and high compliance, i.e. in which regulations contain severe penalties for cases of non-compliance, the regulations themselves may provide sufficient incentive to comply. However, in states with non-stringent regulations and high compliance, there may be additional incentives motivating individuals' decision to comply. Further, both regulatory and IAD scholarship suggest that additional factors beyond those relating to policy design are influential in shaping individuals' compliance behavior. Given data limitations, only Florida is explored in this paper. Survey response rates for Virginia in the follow-up regulatory compliance study were too low to pursue a comparative analysis. Further inquiry into the reasons behind the low response rate revealed that the author's survey was administered in near temporal proximity to others possibly contributing to surveyee fatigue and/or confusion about the intent of this survey in comparison to others administered around the same time. Nevertheless, Florida offers a theoretically useful appropriate case in which to study regulatory compliance.

In a broader context, Florida has supported an active finfish, shellfish, and ornamental fish industry, though, until recently, it was best known for shellfish production. The state has abundant water sources between the Atlantic and Gulf Coasts to support the development of aquaculture, though current leasing and zoning policies may limit the availability and access to such resources. The state has actively expressed support for the development of aquaculture, touting benefits to ecosystem diversity and preservation of wild fish stocks. Manifestations of this support include the implementation of work transition programs, which provide training for commercial fishermen interested in entering the aquaculture industry, as well as aquaculture subsidy programs which provide individuals the opportunity to start up aquaculture operations at a reduced cost. In such programs, new industry entrants may obtain aquaculture leases within designated Aquaculture Opportunity Zones (AOZs) at subsidized costs.

The state has well-developed regulations for governing aquaculture. In Florida, the Division of Aquaculture (FDACS) was established in 1999 within the Department of Agriculture and Consumer Services for the purposes of developing, implementing, and enforcing aquaculture regulations. The primary document governing the practice of aquaculture in Florida is a comprehensive rule known as the, “Florida Aquaculture Best Management Practices (BMPs) Rule.” This Rule contains regulations pertaining to all aspects of aquaculture production, including facility design specifications, water use and conservation techniques, administrative reporting requirements, and allowable and restricted species.

As a case study, Florida is theoretically appropriate given the objective of studying compliance motivations considering that it has a well-developed regulatory system and that the industry has been around long enough to develop social and industry norms surrounding the practice of aquaculture. As such, it provides an appropriate case within which to analyze in juxtaposition the effect of motivations stemming from the regulatory and social environment.

Methods of Data Acquisition

This analysis is based on original interview and questionnaire data. As a first step in the data acquisition process, semi-structured interviews were conducted with 15 members of the Florida aquaculture community. This sample of interview participants was identified through a modified snowball sampling technique and included five shellfish aquaculture producers, two ornamental fish producers, two ornamental fish processor and handlers, one producer of shellfish and finfish, and five regulatory officials and/or enforcement personnel. A list of potential interview participants was identified based upon conversations with aquaculture stakeholders (e.g., aquaculture producers and representatives from the FDACS) as well as through a list provided by a regulatory official from the FDACS. This regulatory official randomly selected names of potential participants based on geographic region; that is, it was evident that individuals were not selected based on their regulatory standing (i.e., compliance behavior). This was ascertained by the author as aquaculture producers expressed varying degrees of familiarity with FDACS regulatory personnel. While representing only a small percentage of the total population of aquaculture producers in the State (15 out of 415 registered producers), this sample was comprised of individuals reflecting each of the major actor categories within the aquaculture community.

Interview participants were asked to comment specifically on (1) the extent to which they feel that regulations accurately represent the scope of activities that they are involved with on a daily basis; and (2) to comment on whether a fear of financial penalties, a desire to maintain a good reputation with other members of the industry, or personal feelings of guilt associated with non-compliance was most influential in shaping their decisions to comply with regulatory directives. Additional questions posed in the interviews were meant to capture a broader understanding of interviewees' perceptions relating to the aquaculture regulatory context in Florida. For example, interviewees were asked whether they feel regulations should be more or less stringent, the general

level of compliance with regulations, and overall perceptions of the strengths and weaknesses of current state level regulations.

Following the completion of the interviews, an online questionnaire was developed using data obtained through the interviews. This was done foremost as an attempt to ensure that the survey appropriately reflected the regulatory context surrounding aquaculture in Florida. The questionnaire was more sharply crafted than the interview protocol to capture data pertaining to each of the compliance motivations under consideration in this paper, in addition to containing questions relating to the broader regulatory context.

The online questionnaire was administered in the spring and summer of 2011 to 415 aquaculture producers in Florida State. These 415 producers represent the entire population of aquaculture farmers in Florida registered and licensed with current email addresses under the FDACS to practice aquaculture. The email addresses of these individuals were provided to the author by a FDACS regulatory official. Of the 415 aquaculture producers to whom the survey was sent, 78 responded yielding a 19% response rate. The respondent sample included 23 finfish producers, 17 ornamental fish producers, 12 aquaculture processor or handlers, 10 shellfish aquaculture producers, 3 individuals who are both aquaculture processor or handlers and shellfish producers, 2 individuals who are both aquaculture processor or handlers and finfish producers, 1 ornamental and finfish producer, 1 aquaculture processor or handler and alligator producer, and 9 individuals involved in miscellaneous aspects of aquaculture (e.g., live rock, experimental aquaculture, etc.). Though the sample was limited, the respondents appropriately reflect the range of aquaculture participants in the Florida industry which is comprised predominantly of shellfish, finfish, and ornamental fish producers (UDSA, 2006).

Data Analyses

Questionnaire and interview data were analyzed in conjunction to gain a more comprehensive understanding of compliance motivations, unattainable from analyzing one type of data alone. Whereas the qualitative analysis allowed for the opportunity to discern the nuances informing the relationship between compliance motivations among individual producers, the quantitative analysis allowed for a more direct assessment of the relationship between regulatory based and individual and community based motivations and compliance based on a larger sample.

Interview data were analyzed by collating responses to the relevant questions from the interview protocol and identifying trends in responses. Survey data were analyzed using bivariate and multivariate analyses based on responses to questions asking survey respondents to identify the extent to which they feel regulatory enforcement personnel are knowledgeable about aquaculture (Independent Variable or IV₁); perceived regulatory appropriateness (IV₂); the extent to which regulations are perceived as being consistent with industry level best business practices (IV₃); whether or not respondents regularly communicate with regulating agencies to discuss aquaculture regulations (IV₄); the extent to which a fear of financial penalties (IV₅); a desire to maintain a good reputation with other industry members (IV₆); feelings of guilt associated with non-compliance (IV₇); and a moral obligation to produce a good product (IV₈) are important to respondents in making compliance decisions, and levels of compliance (DV₁). Each of these variables was treated as independent variables, except for level of compliance, which was the dependent variable. Each of these independent and dependent variables was operationalized in the questionnaire as described in Table 2.

Table 2 Here

Given that the variables under consideration are all ordinal, for the bivariate analysis, Kendall's Tau correlations were conducted to determine if statistically significant relationships exist between each of the independent variables and dependent variable of interest. For the multivariate analyses, ordered logistic regressions were conducted to determine if the independent variables were significant predictors of compliance.⁴ No more than four predictor variables were included in each regression analysis, given that the total number of observations included in the regressions ranged from 54 to 55. The number of predictors selected for the models was based on the recommendation that the sample size should be at least 10 times the number of predictors in logistic regression analyses (Harrel et al. 1985; Peduzzi et al., 1996; Van Belle, 2002).⁵ Also motivated by the small sample size, two models were conducted in which two sets of four predictor variables were considered (one set including regulatory based compliance motivations and one set including individual and community based motivations) along with one final model that examined the best predictors from these in relation to compliance. Each ordered logistical regression was conducted using the robust command in the statistical software program, Stata 10.1.

Results

⁴ To determine if the data were normally distributed, skewness statistics were calculated for each of the independent variables and dependent variables included in the analysis. Results from this analysis revealed that the following variables exceed the acceptable skewness values of +1/-1 (Leech et al. 2007): Compliance motivation: face financial penalties, (skewness value: -1.41), compliance motivation (skewness value: -1.37), moral obligation to produce a good product (skewness value: -2.92), compliance (skewness value: -1.90). Because each of the variables under consideration is ordinal, transformation of the data to correct for non-normality was not conducted. The author opted instead to conduct non-parametric statistical techniques.

⁵ It has been cautioned that logistic regression tends to overestimate odds ratios or beta coefficients when dealing with smaller samples. However, the author feels for two reasons that the use of logistic regression with the small size does not pose any serious threats in the analysis: First, overestimation does not pose any relevant threats in single studies. Rather, this overestimation becomes an issue when several small studies with overestimated effects are combined without due consideration of the exaggerated effects (Nemes et al., 2009). Second, the author is foremost interested in the significance of the relationship and secondarily with the size of the coefficients.

A review of results from the interviews will first be discussed, followed by a discussion of results from the analyses of questionnaire data.

Interview Results

Interview participants were asked to comment specifically on the extent to which they feel that regulations accurately represent the scope of activities that they are involved with on a daily basis (Interview Question: “In the regulations, you are/are not listed in relation to many activities, such as x, y, z. How do you think this reflects the scope of activities that you are involved in on a daily basis?”). In response to this question, 13 out of 15 interviewees indicated that regulations are broad enough in scope to account for their daily activities. One aquaculture producer, commenting on both the scope of regulations as well on the extent to which they are consistent with industry best practices, stated, "Regulations cover every aspect of what producers are involved with when it comes to aquaculture; but a lot of it, such as disease management, is stuff that producers would do anyway" (Interviewee ID: 018). Another producer commented on the scope of regulations, the knowledge of enforcement personnel, social disapproval of non-compliant behavior, and the relationship between regulations and industry best practices, saying, "The regulations cover the gamut of what producers do on a daily basis when it comes to their aquaculture operations. DACS representatives are intimately acquainted with aquaculture. If someone is flagrantly negligent of regulations, the whole aquaculture community frowns upon that. That which is included in the BMPs is really the best thing to do for your business and operation" (Interviewee ID: 019).

Interview participants were also asked to comment on whether a fear of financial penalties, a desire to maintain a good reputation with other members of the industry, or feelings of guilt was most influential in shaping their decisions to comply with regulatory directives (Interview Question: “If you had to weight a fear of monetary sanctions or penalties, a desire to maintain a good reputation with other industry members, and feelings of guilt from not complying with regulations,

which would you say is the most important in influencing your compliance decisions?”). Twelve out of 15 interviewees responded to this question. Some interviewees explicitly weighted these motivations in relation to one another, while others provided varying responses based upon their interpretation of the question. In the case of the latter, interviewees stated the motivation(s) most influential for them beyond the three that the author explicitly inquired about. Table 3 provides a breakdown of interviewee responses. With respect to the aforementioned compliance motivations, a desire to maintain a good reputation with industry members and feelings of guilt associated with non-compliance⁶ were cited more often than a fear of financial penalties as a primary compliance motivation. Regarding reputational concerns, one producer commented, "Reputation is everything. People in the community know each other and there is a concern regarding integrity and character" (Interviewee ID: 018). This same interviewee said about guilt being a primary compliance motivator, "Guilt is also important. I have to live with myself." Another interviewee commented about reputation, "Industry is kind of like a club. If you know someone is not doing what they are supposed to -- others will turn on you. This is because someone's bad practice impacts the whole industry" (Interviewee ID: 025). Reputation and guilt were cited as primary compliance motivators by each type of actor included in the interview sample (i.e. regulators, aquaculture producers, and processor/handlers).

Table 3 Here

⁶ In many cases, interviewees cited "a desire to do what is right" as a compliance motivation. In Table 2, this was coded as feelings of guilt and this response implies that individuals are morally concerned with complying with regulations.

These interview findings provide some qualitative insight into the regulatory context of aquaculture in Florida. The results indicate that regulations are largely perceived as appropriately reflecting the scope of activities in which members of the aquaculture community are regularly engaged. Further, the results indicate that a desire to maintain a good reputation with fellow industry members and feelings of guilt associated with non-compliance are both important compliance considerations among members of the aquaculture community. They also show, that when asked to weight the relative influence of these factors alongside a fear of financial penalties, the former tend to be more influential.

While this qualitative insight is useful in understanding contextual elements of the regulatory environment in terms of a few variables, a more complete analysis of each of the compliance motivations examined in this paper was conducted using quantitative data obtained through the online questionnaire, the results of which are presented next.

Questionnaire Results: Bivariate Analysis

First, bivariate analyses were conducted to determine whether or not the independent variables of interest were significantly correlated with the dependent variable. The results from these analyses are provided in Table 4. In support of the posited propositions, each of the regulatory based motivations ('knowledgeable enforcement personnel,' 'appropriate regulatory scope,' 'regulations consistent with industry best practices,' and 'farmer regularly communicates with regulating agencies') and individual and community based motivations ('fear of facing financial penalties,' 'desire to maintain good reputation with industry members,' 'guilt,' and 'moral obligation to produce a good product') under consideration were found to be significantly and positively correlated with compliance, except for 'farmer regularly communicates with regulating agencies' and 'moral obligation to produce a good product.'

Table 4 Here

Questionnaire Results: Multivariate Analyses

Building on the results of the bivariate analysis, ordered logistic regression analyses were conducted to assess the relationship between the various compliance motivations and compliance when modeled alongside one another. These results are displayed in Tables 5, 6, and 7. The first table displays results from an analysis of regulatory based compliance motivations; the second from an analysis of individual and community based compliance motivations; and the third from an analysis that examines the significant predictors from the other two models alongside each other. The tables display the ordered log odds regression coefficients and associated odds ratios, robust standard errors, number of observations included in the model, and the model's McFadden's Pseudo R^2 , Wald χ^2 statistic, and overall model significance (Prob > χ^2).

Table 5 contains the results of the first model to examine regulatory based compliance motivations. The results indicate that the model as a whole is significant at the .01 level (95% confidence interval) according to the model's Wald χ^2 statistic equal to 13.30. The model has a Pseudo R^2 equal to 19%. Of all the independent variables included in the model, the coefficient for 'knowledgeable enforcement personnel' was significant at the .01 level (95% confidence interval). The interpretation of this result is that for a one unit increase in 'knowledgeable enforcement personnel' (i.e., going from 0 to 1 or "somewhat agree to totally agree"), there is an expected increase of .68 in the log odds of being in a higher level of comply (i.e., "neither agree nor disagree" to "partially agree" or "partially agree" to "totally agree"), given all of the other variables in the model are held constant. However, because log odds are difficult to interpret, the odds ratios relating to each of these coefficients were also calculated (odds ratios were calculated by exponentiating the coefficient, e^{coef}). Odds ratios are easier to interpret as they indicate the proportional likelihood of being at a higher level in the dependent variable based on a one unit increase in the predictor variable. So, for example, for 'knowledgeable enforcement personnel,' the

odds ratio calculation demonstrates that for a one unit increase in this variable, the odds of a higher level of compliance are 1.98 times greater, given the other variables are held constant.

Table 5 Here

Model 2, the results of which are displayed in Table 6, examines individual and community based motivations in relation to compliance. The results indicate that this model too is significant at the .01 level (95% confidence interval) according to the model's Wald Chi² statistic equal to 15.40. The model has a Pseudo R² equal to 14%. Of all the independent variables included in the model, the coefficients for 'desire to maintain a good reputation with industry members' and 'guilt' were found to be significant at the .05 level (95% confidence interval). For the former, a one unit increase in 'desire to maintain a good reputation with industry members,' is associated with a .58 increase in the log odds of being in a higher level of compliance, corresponding to an odds ratio of 1.79, given that all of the other variables in the model are held constant. For the latter, for a one unit increase in 'guilt,' we expect to see a .44 increase in the log odds of being in a higher level of compliance, corresponding to an odds ratio of 1.55, holding all other variables constant.

Table 6 Here

A third model assessed only those variables whose coefficients were found to be significant in Models 1 and 2 in relation to compliance: 'knowledgeable enforcement personnel,' 'desire to maintain a good reputation with industry members, and 'guilt.' The results from this analysis are provided in Table 7. Model 3 was the strongest of three regression models; significant at the .01 level (95% confidence interval) according to the model's Wald Chi² statistic equal to 25.47. The model has a Pseudo R² equal to 30%. The coefficients of all three independent variables included in the analysis were found to be significant, with 'knowledgeable enforcement personnel' and 'desire to maintain a good reputation with industry members' significant at the .01 level (95% confidence interval) and

'guilt' significant at the .05 level (95% confidence interval). Based on the results, for a one unit increase in 'knowledgeable enforcement personnel,' there is an expected increase of 1.09 in the log odds of being in a higher level of compliance, corresponding to an odds ratio of 2.96, for a one unit increase in 'desire to maintain a good reputation with industry members,' there is an expected increase of .79 in the log odds of being in a higher level of compliance, corresponding to an odds ratio of 2.21, and for a one unit increase in 'guilt,' there is an expected increase of .57 in the log odds of being in a higher level of compliance, corresponding to an odds ratio of 1.77, given all of the other variables in the model are held constant.

Table 7 Here

To further ascertain the robustness of the significance of these variables in relation to the all of the independent variables tested, different combinations of regulatory based and individual and community based motivations were analyzed together in separate logit models (the results of which can be found in Appendix A). This was done in an effort to determine if modeling different combinations of regulatory and individual and community based factors together would impact which predictors were showing up as significant. These additional tests demonstrate that the coefficients for 'knowledgeable aquaculture personnel,' 'desire to maintain a positive reputation with industry members,' and 'guilt' remain significant even when these variables are modeled with different combinations of variables.⁷ As an additional attempt to demonstrate the robustness of the

⁷ Combination 1: Desire to maintain a good reputation with industry, appropriate regulatory scope, regulations consistent with industry best practices, and farmer regularly communicates with regulating agencies.

Combination 2: Guilt, appropriate regulatory scope, regulations consistent with industry best practices, and farmer regularly communicates with regulating agencies.

Combination 3: Knowledgeable enforcement personnel, fear of facing financial penalties, and moral obligation to produce a good product.

significance of these variables, two ordinary least square regression models were conducted assessing the relationship between regulatory based motivations and compliance (multiple regression Model 1) and individual and community based motivations and compliance (multiple regression Model 2) (results for these analyses can be found in Appendix B). Both models were significant at the .05 level with adjusted R^2 values of 33% (model 1) and 29% (model 2). In model 1, 'knowledgeable enforcement personnel' was significant. In model 2, 'desire to maintain a good reputation with industry members' was the only significant variable. Multicollinearity diagnostics conducted along with these models demonstrate a lack of multicollinearity between the predictor variables under consideration.

Discussion and Conclusions

This paper explores factors motivating regulatory compliance. This issue was examined in the context of aquaculture in the State of Florida. The IAD framework was applied as a means to organize an inquiry of compliance motivations found to be influential in past regulatory and IAD scholarship. The IAD framework is designed to assist in the systematic investigation of behavior in rule-governed contexts, specifically highlighting the influence of individual and community based factors. Given the diversity of variables found by regulatory scholars to shape compliance, and a resultant inability to identify a theory of regulatory compliance to guide an examination of compliance motivations, an analytical lens is useful that can at least identify classes of variables that should be jointly assessed in such an investigation. The IAD framework is a particularly applicable analytical approach in light of recent regulatory scholarship that emphasizes the role of normatively-oriented compliance motivations stemming from actors' individual and community contexts, while also explicitly drawing upon the relationship between formal and informal rules.

The influence of eight different motivations on compliance was examined using a mixed-method approach. The first set of motivations analyzed were characterized as regulatory based, and

include: 'the extent to which individuals feel regulatory enforcement personnel are knowledgeable about aquaculture,' 'perceived regulatory appropriateness,' 'the extent to which regulations are perceived as being consistent with industry level best business practices,' and 'whether or not individuals regularly communicate with members of regulating agencies to discuss aquaculture regulations.' The second set of motivations analyzed were characterized as being individual or community based, and include: 'a fear of financial penalties,' 'a desire to maintain a good reputation with other industry members,' 'feelings of guilt associated with non-compliance,' and 'a moral obligation to produce a good product.' Overall, the results of the analysis indicate that the following three factors are significant predictors of compliance: 'perception by regulatees that those enforcing regulations are knowledgeable,' 'a desire to maintain a good reputation with other members of the industry,' and 'feelings of guilt associated with non-compliance.'

Interview and questionnaire data were analyzed conjunctively to arrive at these overall conclusions. Interview data provided a contextual understanding of the regulatory environment surrounding aquaculture in Florida, focusing on four factors, 'appropriateness of regulatory scope,' 'fear of financial penalties,' 'a desire to maintain a good reputation with industry members,' and 'feelings of guilt associated with non-compliance.' The interview question pertaining to the appropriateness of regulatory scope was meant primarily to capture a descriptive understanding of interviewees' perceptions regarding this factor. The interview question pertaining to 'fear of financial penalties,' 'a desire to maintain a good reputation with industry members,' and 'feelings of guilt associated with non-compliance,' was designed to understand the relative influence of these factors in shaping interviewees' compliance decisions. This question specifically asked interview participants to weight these three factors based on which is most influential to them when making compliance decisions. Interview findings indicate that the latter two of these motivations are important considerations for aquaculture community members when making compliance decisions

and that both are individually more influential than a fear of financial penalties.

Findings relating to the influence of individual and community based motivations on compliance were further corroborated through the analysis of questionnaire data in which, of the eight motivations examined, reputational concerns and guilt were found to be significant predictors of compliance, along with perceptions that enforcement personnel are knowledgeable about aquaculture. This finding regarding the perceived competence of enforcement personnel as a significant predictor of compliance offers a contribution to the regulatory scholarship as few others have subjected this variable to empirical testing (Bardach and Kagan, 1982; Gunningham et al. 2005).

While these findings are supported by empirical research relating to the IAD framework and regulatory scholarship, it is difficult to say for certain why some factors were more important in the context of aquaculture in Florida than others. The fact that reputational concerns was a significant factor in this study context was expected given that the industry in Florida has had sufficient time to develop and that aquaculture producers have a proclivity to develop industry level best management practices. It is also unsurprising that guilt was a significant predictor given that non-compliance with regulations can have grave consequences, particularly relating to human health and the environment. Other findings were more unexpected. For example, why is it that perceived regulatory appropriateness was not found to be a significant predictor of compliance? Perhaps this is because Florida regulations are noted by aquaculturists, both in and outside of the state, as being especially broad in scope and thus there is not enough variability in the study populations' views regarding this factor to assess its influence in relation to compliance.

The primary limitation associated with the analysis is the small sample size. Providing a mixed-method analysis, employing both interview and questionnaire data, as well as conducting multiple statistical tests to demonstrate the robustness of significant variables does help to legitimate

the findings despite the sample size. Further, given that the online questionnaire was administered to the entire population of aquaculture producers in Florida, the vast majority of which the author had no previous contact with, a 19% response rate is considered respectable.

The extent to which the findings are generalizable to a broader context is difficult to fully ascertain given that the study was based on the examination of a single case and the limited sample size. Again, the author sought to ameliorate the effect of these limitations by selecting a typical case within the aquaculture context and conducting a mixed-method analysis to triangulate and demonstrate the robustness of findings. Clearly, however, such a study should be replicated in additional states and in the context of different industries. The aquaculture industry is characteristically similar to other natural resource based industries in which regulations tend to be fairly technical, where decentralization of regulatory governance is commonly observed (May, 2005), and where there are complex interdependencies between among ecological, economic, technical, and social factors (Firestone et al., 2004). As such, it is expected that the findings of this study regarding compliance motivations should be at least somewhat generalizable to other industry contexts, though this supposition must be subject to empirical testing.

This paper lends credence to past research within the regulatory field and the IAD framework that outline a number of regulatory, individual, and community based motivations for affecting compliance. Through an application of the IAD framework, this paper adds to the compliance literature by highlighting one approach for a systematic and comprehensive examination of diverse compliance motivations. Such approaches are useful in the absence of clear theories of regulatory compliance that specify which variables should be excluded and included in comprehensive analyses of compliance motivations. Through the application of this framework, this paper builds upon normatively oriented compliance studies that illuminate the role of variables such as guilt and social disapproval (Grasmick and Bursik, 1990; Sutinen and Kuperan, 1999). Perhaps

more significantly, the framework is particularly well-suited for expanding upon regulatory scholarship dedicated to uncovering the interplay between formal and informal rules (Gezelius, 2003). Understanding this relationship, in particular, is critical in any rule-governed context; both for discerning the motivations likely to be most influential within a particular context as well as for improving the efficacy and appropriateness of rules.

Tables

Table 1. Propositions for Testing Compliance Motivations

Compliance Motivation	Related Proposition Vis-à-vis Compliance	Type of Motivation
	<i>Compliance with regulatory directives will be higher when individuals...</i>	
Knowledgeable enforcement personnel	...perceive that those enforcing them are knowledgeable.	Regulatory based
Appropriate regulatory scope	...perceive that regulations accurately represent the scope of their daily activities.	Regulatory based
Regulations consistent with industry best practices	...perceive them to be consistent with industry level best practices.	Regulatory based
Farmer regularly communicates with regulating agencies	...regularly communicate with members of the regulating agency concerning regulatory matters.	Regulatory based
Fear of facing financial penalties	...fear financial penalties from not complying.	Individual or community based
Desire to maintain a good reputation with industry members	...fear that not complying will result in a negative reputation with fellow industry members.	Individual or community based
Guilt	...feel a strong sense of guilt from not complying.	Individual or community based
Moral obligation to produce a good product	...possess a strong moral obligation to produce a good product.	Individual or community based

Table 2. Analytical Variables and Related Operationalizations in Questionnaire

Variable	Corresponding Question or Statement in Questionnaire	Response Scale in Questionnaire (Corresponding Numeric Scale)
DV: Compliance	“I always comply with aquaculture regulations.”	Totally disagree to totally agree (-2 to +2)
IV ₁ : Knowledgeable enforcement personnel	“Those enforcing aquaculture regulations are knowledgeable about aquaculture.”	Totally disagree to totally agree (-2 to +2)
IV ₂ : Appropriate regulatory scope	“Aquaculture regulations reflect the full scope of activities that I am involved with at my facility on a daily basis.”	Totally disagree to totally agree (-2 to +2)
IV ₃ : Regulations consistent with industry best practices	“State regulations reflect the best business practices of the industry.”	Totally disagree to totally agree (-2 to +2)
IV ₄ : Farmer regularly communicates with regulating agencies	“In the last five years, I have regularly communicated with members of regulating agencies to discuss aquaculture regulations.”	No/Yes (0/1)
IV ₅ : Fear of facing financial penalties	“How important is the possibility of facing financial penalties to you when deciding whether or not to comply with regulations?”	Not important at all to very important (0 to 4)
IV ₆ : Desire to maintain a good reputation with industry members	“How important is maintaining a good reputation with other members of the industry to you when deciding whether or not to comply with regulations?”	Not important at all to very important (0 to 4)
IV ₇ : Guilt	“How important are personal feelings of guilt from not complying with state level regulations to you when deciding whether or not to comply with regulations?”	Not important at all to very important (0 to 4)
IV ₈ : Moral obligation to produce a good product	“How important is a moral obligation to produce a good product to you when deciding whether or not to comply with regulations?”	Not important at all to very important (0 to 4)

Table 3. Breakdown of Interview Responses Regarding Compliance Motivations

Interviewee ID	Interviewee Type	Primary Motivation(s)	Secondary Motivation(s)
012	Regulator	Guilt	-
013	Regulator	Needs the job, reputation, and protect natural environment	-
014	Ornamental processor/handler	Reputation and guilt	Fines
015	Shellfish producer	Fines and guilt	Reputation
016	Shellfish producer	Guilt	Fines
018	Ornamental fish producer	Reputation and guilt	Fines
019	Ornamental fish producer and processor/handler	Reputation and guilt	-
020	Ornamental fish producer	Reputation	Fines
022	Regulator	Consistency in rule enforcement	-
023	Shellfish producer	Following regulations is good for business	-
024	Shellfish producer	Guilt	Fines
025	Shellfish producer	Reputation	-

Table 4. Kendall's Tau Bivariate Correlations between Regulatory Based Compliance Motivations and Individual and Community Based Motivations and Compliance

Independent Variables	Dependent Variable: Compliance
Knowledgeable enforcement personnel (n=55)	.43**
Appropriate regulatory scope (n=64)	.46**
Regulations consistent with industry best practices (n=64)	.43**
Farmer regularly communicates with regulating agencies (n=55)	-.07
Fear of facing financial penalties (n=58)	.33**
Desire to maintain good reputation with industry members (n=58)	.33**
Guilt (n=58)	.37**
Moral obligation to produce a good product (n=58)	.18

** = correlation is significant at the 0.01 level (2-tailed)

* = correlation is significant at the 0.05 level (2-tailed)

Table 5. Model 1: Ordered Logistic Regression for Regulatory Based Compliance Motivations and Compliance

Independent Variables: Regulatory Based Compliance Motivations	Dependent Variable: Compliance	
	Ordered Log Odds Regression Coeff. (Std. Error)	Odds Ratio (Std.Error)
Knowledgeable enforcement personnel	.68** (.25)	1.98 (.55)
Appropriate regulatory scope	.50 (.37)	1.66 (.53)
Regulations consistent with industry best practices	.26 (.32)	1.30 (.42)
Farmer regularly communicates with regulating agencies	-.09 (.65)	.91 (.61)
Number of observations	54	
Pseudo R ²	19%	
Wald Chi ² /sig.	13.30/.010	

** = correlation is significant at the 0.01 level (2-tailed)

* = correlation is significant at the 0.05 level (2-tailed)

Table 6. Model 2: Ordered Logistic Regression for Individual and Community Based Motivations and Compliance

Independent Variables: Individual and Community Based Motivations	Dependent Variable: Compliance	Ordered Log Odds Regression Coeff. (Std. Error)	Odds Ratio (Std.Error)
Fear of facing financial penalties		.26 (.27)	1.30 (.36)
Desire to maintain good reputation with industry members		.58* (.58)	1.79 (.55)
Guilt		.44* (.44)	1.55 (.37)
Moral obligation to produce a good product		-.07 (.42)	.93 (.43)
Number of observations		55	
Pseudo R ²		14%	
Wald Chi ² /sig.		15.40/.004	

** = correlation is significant at the 0.01 level (2-tailed)

* = correlation is significant at the 0.05 level (2-tailed)

Table 7. Model 3: Ordered Logistic Regression for Significant Predictors from Models 1 and 2 and Compliance

Independent Variables: Significant Predictors from Models 1 and 2	Dependent Variable: Compliance	Ordered Log Odds Regression Coeff. (Std. Error)	Odds Ratio (Std.Error)
Knowledgeable enforcement personnel		1.09** (.26)	2.96 (.86)
Desire to maintain good reputation with industry members		.79** (.26)	2.20 (.73)
Guilt		.57* (.24)	1.77 (.46)
Number of observations		55	
Pseudo R ²		30%	
(Table 5.7 Continued)			
Wald Chi ² /sig.		25.47/.000	

** = correlation is significant at the 0.01 level (2-tailed)

* = correlation is significant at the 0.05 level (2-tailed)

Appendices

Appendix A. Supplementary Ordered Logistic Regression Analyses

Combination 1

Dependent Variable: Compliance		
Ordered Log Odds Regression	Odds Ratio	
Coeff. (Std. Error)	(Std.Error)	
.89** (.24)	2.44 (.73)	Desire to maintain a good reputation with industry members
.71 (.38)	2.03 (.65)	Appropriate regulatory scope
.61 (.37)	1.84 (.59)	Regulations consistent with industry best practices
-.07 (.73)	.93 (.65)	Farmer regularly communicates with regulating agencies
54		Number of observations
22%		Pseudo R ²
17.69/.001		Wald Chi ² /sig.

** = correlation is significant at the 0.01 level (2-tailed)

* = correlation is significant at the 0.05 level (2-tailed)

Combination 2

Dependent Variable: Compliance		
Ordered Log Odds Regression		
	Coeff. (Std. Error)	Odds Ratio (Std.Error)
Guilt	.60* (.25)	1.82 (.44)
Appropriate regulatory scope	.64 (.41)	1.89 (.60)
Regulations consistent with industry best practices	.41 (.35)	1.51 (.47)
Farmer regularly communicates with regulating agencies	.34 (.78)	1.41 (1.00)
Number of observations	54	
Pseudo R ²	19%	
Wald Chi ² /sig.	13.93/.008	

** = correlation is significant at the 0.01 level (2-tailed)

* = correlation is significant at the 0.05 level (2-tailed)

Combination 3

Dependent Variable: Compliance		
	Ordered Log Odds Regression Coeff. (Std. Error)	Odds Ratio (Std.Error)
Knowledgeable enforcement personnel	.92** (.25)	2.50 (.66)
Fear of facing financial penalties	.46 (.25)	1.59 (.44)
Moral obligation to produce a good product	.52 (.40)	1.67 (.70)
Number of observations	55	
Pseudo R ²	19%	
Wald Chi ² /sig.	20.37/.000	

** = correlation is significant at the 0.01 level (2-tailed)

* = correlation is significant at the 0.05 level (2-tailed)

Appendix B. Ordinary Least Squares Regression Results

Model 1: Multiple regression results for regulatory based compliance motivations and compliance

	Unstandardized Coefficients	Collinearity Statistics	
		Tolerance	VIF
Knowledgeable enforcement personnel	.21*	.70	1.43
Appropriate regulatory scope	.20	.80	1.25
Regulations consistent with industry best practices	.04	.64	1.57
Farmer regularly communicates with regulating agencies	.02	.94	1.07
Number of observations	54		
Adjusted R ²	33%		
F-Statistic/sig.	3.43/0.020		

** = correlation is significant at the 0.01 level (2-tailed)

* = correlation is significant at the 0.05 level (2-tailed)

Model 2: Ordinary least squares regression results for individual and community based motivations and compliance

	Unstandardized Coefficients	Collinearity Statistics	
		Tolerance	VIF
Fear of facing financial penalties	.11	.83	1.20
Desire to maintain good reputation with industry members	.23*	.74	1.36
Guilt	.14	.75	1.34
Moral obligation to produce a good product	-.03	.79	1.27
Number of observations	55		
Adjusted R ²	29%		
F-Statistic/sig.	3.02/.030		

** = correlation is significant at the 0.01 level (2-tailed)

* = correlation is significant at the 0.05 level (2-tailed)

References

- Ajzen, Icek. *Attitudes, Personality, and Behavior*. Buckingham, Great Britain: Open University Press, 1988.
- Amberg, Shannon and Troy E. Hall. "Precision and Rhetoric in Media Reporting About Contamination in Farmed Salmon." *Science Communication* 32, no. 4 (2010): 489-513.
- Armitage, Christopher J. and Mark Connor. "Efficacy of the Theory of Planned Behaviour: A Meta-Analytic Review." *British Journal of Social Psychology* 40 (2001): 471-499.
- Banana, Abwoli Y. and William Gombya-Ssembajjwe. "Successful Forest Management: The Importance of Security of Tenure and Rule Enforcement in Ugandan Forests." In *People and Forests: Communities, Institutions, and Governance*, edited by Clark Gibson, Margaret McKean, and Elinor Ostrom. Cambridge, MA: MIT Press, 2000.
- Bardach, Eugene and Robert A. Kagan. *Going by the Book: The Problem of Regulatory Unreasonableness*. London, U.K.: Transaction Publishers, 1982. Crawford, Sue E.S. and Elinor Ostrom. "A Grammar of Institutions." *American Political Science Review* 89, no. 3 (1995): 582-600.
- Becker, Gary. "Crime and Punishment: An Economic Approach." *Journal of Political Economy*. 76, no. 2 (1968): 169-217.
- Bendor, Jonathan and Dilip Mookherjee. "Norms, Third-Party Sanctions, and Cooperation." *Journal of Law, Economics, and Organization* 6, no. 1 (1990): 33-63.
- Bentham, Jeremy. *An Introduction to the Principles of Morals and Legislation*, edited by W. Harrison. Oxford, England: Basil Blackwell, 1789.
- Burby, Raymond J. and Robert G. Paterson. "Improving Compliance with State Environmental Regulations." *Journal of Policy Analysis and Management* 12 (1993): 753-772.
- Coleman, James S. *Foundations of Social Theory*. Chicago, IL: Belknap Press, 1990.
- Elster, Jon. "Social Norms and Economic Theory." *Journal of Economic Perspectives* 3, no. 4 (1989a): 99-117.
- Elster, Jon. *The Cement of Society: A Study of Social Order*. Cambridge, England: Cambridge University Press, 1989b.
- Etienne, Julien. "Compliance Theory: A Goal Framing Approach." *Law & Policy* 33 (2011): 305-333.
- Firestone, J., W. Kempton, A. Krueger, and C. Loper. "Regulating Offshore Wind Power and Aquaculture: Messages from Land and Sea." *Cornell Journal of Law and Public Policy* 14 (2004): 71-111.
- Frey, Bruno S. "How Intrinsic Motivation is Crowded Out and In." *Rationality and Science* 6, no. 3 (1994): 334-352.
- Gerring, John. *Case Study Research: Principles and Practices*. New York, NY: Cambridge University Press, 2007.

- Gezelius, Stig S. *Regulation and Compliance in the Atlantic Fisheries*. London: Kluwer Academic Publishers, 2003.
- Grasmick, Harold G. and Robert J. Bursik, Jr. "Conscience, Significant Others, and Rational Choice: Extending the Deterrence Model." *Law & Society Review* 24, no. 3 (1990): 837-861.
- Gray, Wayne B. and John Scholz. "Does Regulatory Enforcement Work? An Panel Analysis and OSHA Enforcement." *Law & Society Review* 27 (1993): 177-213.
- Gunningham, Neil A., Dorothy Thornton, and Robert A. Kagan. "Motivating Management: Corporate Compliance in Environmental Protection." *Law & Policy* 27, no. 2 (2005): 289-316.
- Harell, FE, Lee KL, Matchar, DB, Reichart TA. 1985. "Regression Models for Prognostic Prediction: Advantages, Problems, and Predictions." *Cancer Treat Rep* 69, no. 10 (1985): 10171-1077.
- Hart, H.L.A. *The Concept of Law*. Oxford: Clarendon Press, 1997.
- Hatcher, Aaron, Shabbar Jaffry, Olivier Thebaud, and Elizabeth Bennett. "Normative and Social Influences Affecting Compliance with Fishery Regulations." *Land Economics* 76, no. 3 (2000): 448-461.
- Helland, Eric. "The Enforcement of Pollution Control Laws: Inspections, Violations, and Self-Reporting." *Review of Economics and Statistics* 80 (1998): 141-153.
- Jentoft, Svein. "Institutions in Fisheries: What They Are, What They Do, and How They Change." *Marine Policy* 28 (2004): 137-149.
- Kuperan, K., and Jon G. Sutinen. "Compliance with Zoning Regulations in Malaysian Fisheries." In *International Cooperation for Fisheries and Aquaculture Development: Proceedings of the VIIIth Conference of the International Institute of Fisheries Economics and Trade*, Vol. I, edited by D.S. Liao. Keelung, Taiwan: National Taiwan Ocean University, 1995.
- Leech, Nancy L., Karen C. Barrett, and George A. Morgan. *SPSS for Intermediate Statistics*, 3rd ed. Mahwah, NJ: Lawrence Erlbaum Associated, Inc. Publishers, 2007.
- Levi, Margaret *Of Rule and Revenue*. Berkeley, CA: University of California Press, 1988.
- May, Peter J. "Compliance Motivations: Affirmative and Negative Bases." *Law & Society Review* 38, no. 1 (2004): 41-68.
- May, Peter J. "Compliance Motivations: Perspectives of Farmers, Homebuilders, and Marine Facilities." *Law & Policy* 27, no. 2 (2005): 317-347.
- Mazur, Nicole and Allan L. Curtis. "Risk Perceptions, Aquaculture, and Issues of Trust: Lessons From Australia." *Society and Natural Resources* 19 (2006): 791-808.
- McCay, Bonnie J. "Emergence of Institutions for the Commons." In *The Drama of the Commons*, edited by Elinor Ostrom, Thomas Dietz, Nives Dolsak, Paul C. Stern, Susan Stonich, and Elke U. Weber. Washington, D.C.: National Academy Press, 2002.

- National Oceanic and Atmospheric Administration. "National Aquaculture Act." Public Law 96-362, 94 Stat. 1198, 16 U.S.C. 2801, et seq. 1980. http://www.nmfs.noaa.gov/sfa/sfweb/aqua_act.htm (accessed October 24, 2010).
- National Oceanic and Atmospheric Administration. 2009. <http://aquaculture.noaa.gov> (accessed January 14, 2009).
- Naylor, Rosamond L., Rebecca J. Goldberg, Jurgenne H. Primavera, Nils Kautsky, Malcolm C. M. Beveridge, Jason Clay, Carl Folke, Jane Lubchenco, Harold Mooney, and Max Troell. "Effect of Aquaculture on World Fish Supplies." *Nature* 405, no. 6790 (2000): 1017-1024.
- Nemes, Szilard, Junmei M. Jonasson, Anna Gennell, and Gunnar Steineck. "Bias in Odds Ratios by Logistic Regression Modeling and Sample Size." *BMC Medical Research Methodology* 9 (2009): 1-5.
- Ostrom, Elinor. *Governing the Commons: The Evolution of Institutions for Collective Action*. New York, NY: Cambridge University Press, 1990.
- Ostrom, Elinor. "Institutional Rational Choice: An Assessment of the Institutional Analysis and Development Framework." In *Theories of the Policy Process*, 2nd edition, edited by Paul A. Sabatier. Boulder, CO: Westview Press, 2007.
- Ostrom, Elinor. *Understanding Institutional Diversity*. Princeton, NJ: Princeton University Press, 2005.
- Ostrom, Elinor, Roy Gardner, and James Walker. *Rules, Games, and Common-Pool Resources*. Ann Arbor: University of Michigan Press, 1994.
- Ryan, Richard M. and Edward L. Deci. "Intrinsic and Extrinsic Motivations: Classic Definitions and New Directions." *Contemporary Educational Psychology*. 25 (2000): 54-67.
- Peduzzi PN, Concato J, Kemper E, Holford TT, Feinstein A. "A Simulation of Number of Events Per Variable in Logistic Regression Analysis." *Journal of Clinical Epidemiology*. 99 (1996):1373-1379.
- Posner, Richard A. and Eric B. Rasmusen. "Creating and Enforcing Norms, with Special Reference to Sanctions." *International Review of Law and Economics* 19, no. 3 (1999): 369-382.
- Shepsle, Kenneth. "Rational Choice Institutionalism." In *The Oxford Handbook of Political Institutions*, edited by R.A.W. Rhodes, Sarah A. Binder, and Bert A. Rockman. New York, NY: Oxford University Press, 2006.
- Schlager, Edella. "A Comparison of Frameworks, Theories, and Models of the Policy Process." In *Theories of the Policy Process*, 2nd edition, edited by Paul A. Sabatier. Boulder, CO: Westview Press, 2007.
- Scholz, John T. and Mark Lubell. "Trust and Taxpaying: Testing the Heuristic Approach to Collective Action." *American Journal of Political Science* 42 (1998): 398-417.
- Saba Siddiki and Christopher M. Weible. "Perceived Barriers and Industry Strategies for Continued U.S. Aquaculture Development." *Global Aquaculture Advocate*, July/August, 2011.
- Speer, Johanna . "Participatory Governance Against All Odds? A Qualitative Comparative Analysis of Institutional Incentives and Socio-Economic Conditions in Guatemala." n.d.

Sutinen, Jon G. and K. Kuperan. "A Socio-Economic Theory of Regulatory Compliance." *International Journal of Social Economics* 26 (1999): 174-193.

United States Department of Agriculture National Agricultural Statistics Service. 2006. "Aquaculture -- Florida Aquaculture Sales Total \$75 Million in 2005." 2006.
http://www.nass.usda.gov/Statistics_by_State/Florida/Publications/Aquaculture/06aqua4.pdf
(accessed August 20, 2011).

Van Belle, G. *Statistical Rules of Thumb*. New York: John Wiley, 2002.

Zimring, Franklin E. and Gordon Hawkins. *Deterrence: The Legal Threat in Crime Control*. Chicago, IL: University of Chicago Press, 1973.