Finding Blame for Environmental Outcomes: A Cognitive Style Approach to Understanding Stakeholder Attributions, Attitudes, and Values

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FINDING BLAME FOR ENVIRONMENTAL OUTCOMES: A COGNITIVE STYLE APPROACH TO UNDERSTANDING STAKEHOLDER ATTRIBUTIONS, ATTITUDES, AND VALUES

A Dissertation Presented

by

CHRISTOPHER T. HAWKINS

Submitted to the Graduate School of the University of Massachusetts Amherst in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

September 2011

Environmental Conservation Policy and Human Dimensions Concentration
Finding Blame for Environmental Outcomes: A Cognitive Style Approach to Understanding Stakeholder Attributions, Attitudes, and Values

A Dissertation Presented

by

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DEDICATION

This dissertation is dedicated to my grandfather, Thomas W. Merrigan, a man who has provided me with a tremendous amount of encouragement, inspiration, and love over these past 36 years. Thank you.
ACKNOWLEDGMENTS

Many individuals were involved in this research and are deserving of credit. I am extremely grateful to the members of my academic committees—Bob Muth, Gary Matlock, Paul Ticco, Jack Finn, and Paula Stamps—for their guidance, support, and encouragement throughout this project. I am especially indebted to my committee chair and Ph.D. advisor, David Loomis, for his mentorship, support, and friendship during these past several years. I would like to thank fellow graduate students Laura Anderson, Shona Paterson, Ben Poole, and Sarah Young, as well as undergraduate student Ed McCorkindale, for their contribution to my dissertation. Additionally, several of my NOAA Fisheries Service colleagues, including Adam Bailey, Melanie Jordan, and Phyllis Ha, as well as my supervisor, Alvin Katekaru, provided various kinds of assistance. I am also grateful for the editing help provided by Megan Hawkins, the survey implementation assistance provided by Ryan Hawkins, and the survey data entry provided by Rosemary Loomis.

I would like to thank the Nature Conservancy Florida Keys Program for funding this research. I am indebted to the hundreds of recreational anglers, SCUBA divers, and commercial fishermen who participated in this survey project.

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ABSTRACT

FINDING BLAME FOR ENVIRONMENTAL OUTCOMES: A COGNITIVE STYLE APPROACH TO UNDERSTANDING STAKEHOLDER ATTRIBUTIONS, ATTITUDES, AND VALUES

SEPTEMBER 2011

CHRISTOPHER T. HAWKINS, B.A., MASSACHUSETTS MARITIME ACADEMY
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This study sought to connect two bodies of knowledge—integrative complexity and attribution theory. Integrative complexity is a term that indicates the simplicity vs. complexity of a person’s mental frame and perceptual skill. A person who perceives nuance and subtle differences typically scores higher on an integrative complexity measure. Attribution theories are concerned with how individuals perceive causation for various events. The limited research into the linkages between perceived causation for an event and how complexly a person thinks about the domain of that event, coupled with the dearth of attribution research in the natural resource management literature, inspired this research. Florida Keys coral reef users were sent a mail questionnaire between July 2009 and March 2010. Integrative complexity level was determined using an index that was developed for this research. Based on attributional and cognitive complexity literature, it was hypothesized that people who score lower in integrative complexity would exhibit an “external” attribution pattern. Integrative complexity was also proposed to influence: attitude and value extremity; number of perceived problem causes; and use of mediated communication. Finally, it was hypothesized that individuals will assign more blame to other groups than to their own. Six of the study’s seven null hypotheses were rejected: 1) a significant
relationship was found between integrative complexity level and the number of causes that respondents recorded for the decline of the Florida Keys reef ecosystem, 2) significant differences were observed in attitude extremity according to integrative complexity, 3) significant differences were observed in value orientation according to integrative complexity, 4) significant differences were observed in value extremity according to integrative complexity level, 5) significant differences were observed in mediated communication according to integrative complexity level, and 6) significant differences were observed in blame pattern according to group affiliation. Only one null hypothesis was not rejected: no support was found for a connection between integrative complexity and attribution style. These results indicate support for the integrative complexity index, though work to refine the measure seems in order. Additional recommendations for future research include investigating new approaches to examining the relationship between integrative complexity and attribution style.
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CHAPTER 1
INTRODUCTION

The focus of this dissertation is a theoretical examination of the role that integrative complexity plays in the attribution of responsibility for negative environmental outcomes. A topic such as this falls within the human dimensions of natural resource management, rather than the ecological or biophysical dimensions. It is appropriate and important to incorporate a predictive understanding of people in natural resource management because so much of an agency’s effort is focused on managing society: pro-environmental outcomes are most, though not always, achieved through the regulation and enforcement of behavior rather than some direct manipulation of nature. This is especially the case in marine resource management (Lackey, 1998).

In the United States, federal, state, tribal, and local governments bear much of the responsibility for ensuring sustainable ecosystem goods and services, through legislation, collaboration, education, regulation, and enforcement. Government in the United States is based on the concept of representative democracy, and throughout the country’s history it is the public that has ultimately dictated, in a broad sense, the appropriate structure of and approach to resource management. The social values that underpin this relationship have evolved over time – influenced by territorial expansion, population growth, resource degradation, and increasingly diverse and numerous commercial and recreational activities. Where there was once vast stretches of unexplored and untamed wilderness, there are now cities, towns, highways, dams, reservoirs, rangeland, and all manner of infrastructure. In response, society’s relationship with its environment has changed.

Meine (1995) recognizes this evolution and the factors that underlie it, and has used it as a basis for discussing and parsing U.S. resource management history. This history can be further demarcated into six distinct eras based on agency history, primary users, social values, population
increase/mobilization, and resource use patterns (Table 1). These eras, as named and described, are reasonable approximations reached, as Miene does, by examining major trends in the country’s environmental history and are offered as a way in which to understand how society’s environmental values have shifted and have in turn influenced policy over time. In many instances, these eras overlap or influence one another irrespective of the dates assigned to them.

**Table 1.** Environmental management eras in the United States (After Loomis, pers. comm.)

<table>
<thead>
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<th>Era</th>
<th>Major Characteristics</th>
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<td>No Systematic Framework (1620-1820s)</td>
<td>Anything goes</td>
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<td>Exploitation/Disposal (1825-1880s)</td>
<td>Land management back to state control</td>
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<tr>
<td>Expert (Progressive) Approach (1885-1920s)</td>
<td>Disciplinary experts hired to manage resources</td>
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<td>Commodity Era (1920s-1960)</td>
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This relationship between social values and resource use means that the actions taken by management agencies should be fairly responsive to broad societal mandates. At no time in the country’s history has there been more evidence for such a view; nearly every relevant piece of major environmental legislation, from the National Environmental Policy Act to the Magnuson-Stevens Fishery Conservation and Management Act, requires substantial public involvement and the explicit consideration of relevant social, cultural, and economic factors in decision-making.

However, this conceptual relationship between social values on the one hand and resource management activities on the other has not yet been universally adopted. Many agencies today trace their roots back to a time when it was fashionable for staff to be comprised exclusively of experts trained by established university ecological and physical science programs. While times have changed, these agencies still find themselves generally adhering to this Expert (Progressive) Era, which was most appropriate, given various societal attributes, from approximately 1885 through the 1920s (see Table 1). Unfortunately, the Progressive Era approach is inadequate to the task of addressing the general complexity inherent in 21st Century
resource management, especially where these issues concern political, economic, and socio-cultural domains (Weinstein et al., 2007). In response, agencies have been encouraged to facilitate greater inclusion of non-traditional disciplines in order that they may be better positioned to address a wider range of social values as well as the underlying behavioral causes of most resource management issues (e.g., Krueger et al., 1986; Kennedy and Thomas, 1995; Witter and Jahn, 1998).

This dissertation is responsive to such calls in that it utilizes the theory, methods and analytical procedures of quantitative social science to examine an important area of natural resource management: understanding how people attribute responsibility for environmental outcomes such as ecosystem degradation or the decline of a commercially-valuable species as a function of their complexity of thought with regard to those issues. Despite its potential management usefulness, relatively few research studies have used attribution theory in the natural resource management arena (J.J. Vaske, personal communication, April 2, 2008), perhaps because blaming is so closely associated with conflict and conflict in natural resource management settings has been studied via other theoretical lenses for a number of years (e.g., goal interference theory).

The implications for natural resource professionals of understanding the characteristics of blaming can be found in efforts to manage disputes between user groups, address stakeholders’ efforts to achieve their goals through political and legal processes, regulate behavior, and communicate efficiently and effectively, since attribution of responsibility plays a role in all of these. Despite claims to the contrary, there are rarely any win-win outcomes in natural resource management policy-making (Lackey, 2006). Research on causal attribution has shown that people are often biased in their perception of whom or what is responsible for an outcome. Thus, even when an outcome is “correct” per a scientific or cost-benefit analysis, individuals who perceive they have been disadvantaged will attribute (or misattribute) blame, with attendant consequences. This presents a problem for resource managers, who strive to make decisions they
believe are logical, equitable, valid and scientifically-correct. As Kumagai et al. (2004) point out, the public may in fact attribute the cause of an unfortunate outcome to the actions (or inaction) of natural resource managers, especially where members of the public lack a personal relationship with those managers.

Thus, understanding the attributional process can aid natural resource managers by: serving as a measure or triangulation of the strength of conflict between two or more stakeholder groups; assisting with the development of more targeted and focused conflict amelioration strategies and more effective communication and outreach programs; and providing another basis from which to interpret the results of knowledge, attitude and perceptions surveys. An attributional understanding of the relevant public also offers managers a way to place individuals into subgroups in order to tailor messages to them; provides for predictions of likely behaviors; and helps to answer questions about people’s behavior towards each other and managers.

The appropriate conceptual framework for the study of attribution of responsibility is attribution theory. Attribution theory is a term that encompasses theories of motivation that address people’s attempts to determine the causes for outcomes or events in the world around them. In these efforts, people are referred to as informal causal theorists who seek to apportion blame and then, often, act on these judgments. Attributions are these “perceived causes.\(^1\)” Attributing cause to effect is not simply a layman exercise. For nearly 100 years, theorists in the social sciences, especially social psychology, have researched the processes involved with attributions, such as knowledge, beliefs, perceptions, and actions. However, formal theories of attribution are relatively recent in the literature (e.g., Kelley, 1967). As the literature review will show, there are several important attribution paradigms and attribution types. Of these, this proposed study is concerned with attributions of responsibility and external versus internal blaming attributions. An external blaming attribution results when a group feels that others are the cause of some problem, whereas an internal attribution reflects a perception of self-blame. To

\(^1\) Where the term \textit{cause} is used throughout this document, it is understood as \textit{perceived} cause.
date, attribution theory in empirical studies of natural resource management problems has been very limited.

The research presented here focuses on the link between process of thought (cognition) and attributions of responsibility, an area that appears to have been relatively neglected, but one that seems crucial to describing and understanding the totality of the attribution construct. Cognition is important because attribution is defined in terms of thinking about and searching out causes for events and problems. While some measures of cognition have been used in the study of attributions, those measures have typically been disciplinarily specific and/or narrowly applied. The findings of these studies suggest that the way in which people assign responsibility is not uniform, but is dependent to some extent on the complexity with which they think about an issue.

There are a variety of measures of cognitive style across the disciplines and fields of psychology, social psychology, political science, and health science. This research will employ a measure termed integrative complexity – an issue-specific gauge of human information processing and decision-making that is concerned with how aware people are of a) different aspects of a problem and b) how those aspects interrelate (Tetlock, 1992). To date, it has not been used much in the study of the antecedents of individual causal attributions. This research aims to address this gap by determining if integrative complexity affects the way in which people belonging to relevant natural resource stakeholder groups assign blame for a problem in which they are believed to have a stake. This project has its immediate roots in a study that was conducted for the Florida Reef Resilience Program (Loomis et al., 2008). In that study, respondents were asked to evaluate the condition of the reefs of the Florida Keys in terms of who was to blame for their decline. Perhaps not surprisingly, each group (anglers, SCUBA divers, and snorkelers) blamed their own activity last. However, no attribution or cognitive frameworks/hypotheses were used in the Loomis et al. study.

As part of the contribution to the literature, a measure of integrative complexity was developed and validated and was used to test the study’s hypotheses. Beyond the primary purpose of
examining the relationship between integrative complexity and attributions of responsibility, this research also studied the linkages between 1) integrative complexity and the number of problem causes that respondents record, 2) integrative complexity and attitude extremity – as evidenced by the magnitude of the agreement or disagreement with several attitudinal questions, 3) integrative complexity and value orientation and extremity – as evidenced by the magnitude of the agreement or disagreement with two value orientation questions, 4) integrative complexity and mediated communication – a concept used to characterize communication channels other than person-to-person exchange of information, and 5) group affiliation and defensive attributions – which are observed when members of groups seek to assign blame away from their own group’s activity.

Theory-testing, rather than management application, is the focus of the research. In practical terms, this means that characteristics ascribed to the sample via segmentation on the independent and dependent variables are not assumed to be generalizable to all members of the groups from which the samples originate. However, the development and testing of the measure used in this research, as well as the extension of theory, are expected to be of management value in the future, as they can be employed in representative studies and those data can then be used by managers interested in the stakeholder cognitive complexity and attributional processes.
CHAPTER 2

LITERATURE REVIEW

Attribution Theory

Background

Attribution is a process that begins with the perception of a cause for an outcome, progresses through judgment and inference about that cause, and ends with some emotion or behavior (Crittenden, 1983). Because attributional research is concerned with the broad topic of causal reasoning – how people infer the underlying causing for situations and events, behaviors and dispositions – there is no single, unified theory of attribution (Fiske and Taylor, 2007). There are instead a variety of (mostly complementary) attribution theories. In general, theorists have focused on three attributional areas: 1) the antecedents of causal reasoning, such as information and motivation, 2) the contents of the attribution process, and 3) the consequences of attributions – such as political or social behaviors (Figure 1).

![A general model of attribution](After Kelley and Michela, 1980)

Attribution research has been a social psychology mainstay for several decades, and has been conducted across a wide range of fields in which understanding individual and group cognition is important. Several paradigms have dominated the study of attributions, with blaming attributions attracting recent attention in fields associated with natural resource management. Within the blaming attribution literature, investigators have found that blaming others serves
various functions, including as a defensive coping mechanism (Shaver, 1975). Researchers have also begun to more thoroughly examine the role that complexity of thought plays in the attributional process and have consequently introduced measures of cognitive style as an explanatory variable in several blaming attribution studies reported in the literature. These will be discussed in detail later. However, these studies have been both infrequent and quite specific in their application.

Structured approaches to understanding perceived causes in a variety of social problem areas has allowed researchers to better articulate those problems and has provided for the creation of more effective ways to solve them (Frieze et al., 1979). Attribution theory is related to a more general area of study that Kelley (1973) referred to as psychological epistemology, which is concerned with the processes by which people “know” their world, and perhaps more importantly, evaluate that knowledge as accurate. Kelly and Michela (1980) have distinguished between attribution and attributional research by defining the former as involving the systematic manipulation or assessment of antecedents and the latter as understanding primarily the consequences of the attribution process. However, this “splitting of hairs” is not necessarily supported by all investigators, as evidenced by Harvey and Weary (1984, p. 428) and Isbell (personal communication, July 30, 2008). Attributions may be a key psychological process because people are thought to have a basic need for control over everyday events and a desire to predict future outcomes of current actions (Fiske and Taylor, 2007). Much of this thinking underlies historical approaches to attribution research (e.g., Heider, 1958; Jones and Davis, 1965). Information about attribution can therefore inform a present course of action; in order to make something happen, it is helpful to know what contributed, or was perceived to contribute, to successes in similar past situations.

As a discrete field of inquiry in social psychology, attributional research has its origins in Heider’s (1958) book, The Psychology of Personal Relations. Heider was primarily interested in enlightening scientific approaches to psychology by harnessing commonsense (or naïve)
psychology – how everyday people make sense of the world around them. In particular, Heider was concerned about the relationship between behavior and whether the pressure to perform such behavior originated from within or was external to the actor. This is known as locus of causality. However, the goal of Heider’s work was broad; he left the development of theoretical relationships and statements to future theorists. The formal study of attributions and the attribution process was iterative in that it evolved organically from the common core issues that these theorists found in naïve psychology; person perception; locus of control; self-perception; disposition research; and theory of emotion (Kelly and Michela, 1980).

Prior to Heider, Thibaut and Riecken (1955) examined helping behavior and social status. These investigators were interested in isolating the perceived reasons (internal or external to the helper) that a person would provide assistance to another in controlled situations. Jones and Davis’s (1965) work on their correspondent inference theory (CIT) followed shortly after Thibaut and Riecken and are often cited as an important predecessor of attribution research because CIT findings have led to questions of when and why people spend time thinking about causation and when they instead use simple cues and heuristics to infer causation. Their theory was focused on perceptions of others’ dispositions and intentions via observable behavior. Jones and Davis investigated several relevant variables involved in disposition/intention perception, including social desirability, social role, prior expectations, and situational constraints.

**Recent Research**

More recent approaches to attribution have typically centered on one of several paradigms. For example, those interested in understanding how people validate their own attributions have used Kelley’s ANOVA Model, while those interested in achievement behavior (e.g., winning a sports contest, doing well on an exam) have gravitated towards the work of Bernard Weiner and colleagues. Finally, those interested in understanding the cognitive
processes associated with blaming have used an attribution of responsibility framework. These three research avenues will be discussed in more detail below.

**Kelley’s ANOVA Model**

Following the work of Heider, Thibaut and Riecken, Jones and Davis, and others, attribution research as it is generally understood today began to emerge. Harold Kelley’s research, including his 1967 publication of an ANOVA model of attribution theory (often referred to as Kelley’s Cube) ushered in a more prominent role for studies of attribution in social psychology. Kelley’s contributions to attribution theory have been important in generating research on causal reasoning. He likened attribution to a cognitive process (or process of thought) akin to an analysis of variance of data patterns (Fiske and Taylor, 2007). In such an analysis, he theorized, people use three types of information to validate their mental examination of cause and effect: distinctiveness, consistency, and consensus (Kelley and Michela, 1980) (Figure 2). In analyzing distinctiveness, the observer is concerned with the uniqueness of an interaction – for example, does person A act negatively towards person B? Questions about consistency (over time and modality) concern whether the interaction is the same across situations. If Person A acts negatively towards person B, is there *always* a negative interaction? Finally, consensus judgments involve others: Are negative interactions between person A and others common? Kelley hypothesizes that people are able to make confident and accurate attributions when they have high levels of information about distinctiveness, consistency, and consensus. However, some combinations can also underpin confident attributions.
Figure 2. Kelley’s attribution cube. In this example, Person A engages in some behavior. A perceiver would then evaluate that behavior in terms of whether Person A engages in the same behavior in various situation/locations (the consistency of his behavior), who else engages in the behavior (the commonality of the behavior), and if Person A engages in the behavior towards anyone else (the personal distinctiveness of the behavior). After Whatley, 2008.

Kelley’s model envisions the social perceiver as collecting information along one of the three information dimensions while holding the other two constant. Doing so for all dimensions and then, essentially, calculating a mental and general $F$ ratio analogous to a statistical analysis of variance is the reason Kelley’s approach has been termed an ANOVA model. In effect, perceivers are looking for situations that are highly distinctive with low variance across time, modality, and persons. Of course, because a perceiver rarely has opportunities to witness every available combination in the cube, Kelley’s model is an idealized version of this process.

In addition to his ANOVA model, and as a reaction to some of the critiques it received, Kelley also conducted research on causal schemes, which were influential on the attribution field. Specifically, he detailed both multiple necessary causal schemas and multiple sufficient causal schemas. Situations involving the former require several necessary factors to induce an effect, such as the training, ability, and effort that it takes to win a championship tennis match. Situations involving multiple sufficient causal schemas are those that require only one or two
components for success (Fiske and Taylor, 2007). Finally, Kelley articulated the discounting principle, which states that people tend to minimize the importance of one cause if they have knowledge of another sufficient cause. He also articulated its mirror, the augmenting principle, which maintains that in the absence of other causes, people will augment (or exaggerate) the value of the salient cause. Research has historically supported the discounting principle (e.g., Van Overwalle and Van Rooy, 2001) while finding that the augmenting principle may play a smaller role in the attribution process.

However, despite Kelley’s contributions to the attribution literature, much of his work (with the exception of work on the discounting principle) appears to have limited relevance to the aims of the current project. This is because Kelley’s interests were quite specific to the understanding of the conditions under which people validate their causal reasoning (Fiske and Taylor, 2007), which is of no practical value to the present study.

**Weiner’s Achievement Model**

In addition to Kelley, the work of Bernard Weiner (Weiner, 1979; 1985; 1995) has been quite influential on the field of attribution research. As with most attribution theorists, Weiner’s work derived from Heider’s, but was different in important ways from other attribution research. Specifically, Weiner was interested in attribution as it applied to a particular behavior: that of achievement behavior – for example, why did a class doing poorly in a subject one year test very well in the same subject a year later? Weiner’s work illustrated several foundational points with regard to causal attribution, namely that unexpected results prompt a search for causes and that several dimensions are needed to help elucidate the causes of behavior. Weiner defined three important dimensions: locus, stability, and controllability. Locus is concerned with whether a person attributes performance to an internal cause, such as hard work. The stability dimension indicates whether that cause is likely to change. Finally, the controllability dimension is related to the amount of control a person has over the eventual outcome (Weiner, 1979; Fiske and Taylor,
Weiner also sought to predict the expectation and emotional consequences of the attribution process. In a typical achievement situation, people first make judgments about their success or failure, and subsequently whether to feel happy or sad. Second, people attribute that outcome to some cause, which results in more specific emotions, such as guilt or pride. Thirdly, people then reflect on how successful they might be in the endeavor in the future. If they feel that their failure was due to low levels of ability, they may likely have low expectations for future success, as well as an emotional feeling akin to hopelessness. Weiner’s model is quite dynamic as it is focused on the linkages between attributions, expectations, emotions, and behavior (Figure 3).

**Figure 3. A causal analysis of achievement behavior.** After Fiske and Taylor, 2007.

While aspects of Weiner’s work are relevant to this dissertation, his model is more applicable to studies involving the attribution process as it relates to situations of personal
achievement or failure. In the case of a natural resource outcome in general, an individual would instead be examining the relative importance of external causal actors and factors. Therefore, we will proceed to a review of more relevant research that has been concerned with the process of how people attribute responsibility to others for an outcome or event.

**Attributions of Responsibility**

While much of the attention in the attribution literature is focused on personal dispositions and achievement behaviors, research has also been conducted on situations that are much broader. In the present case, we are interested in blame, and as Shaver (1975; 1985) notes, *attributions of responsibility* are concerned with whom are to be held accountable for an event, especially a negative or unexpected event. Attributions of responsibility have been a less-studied area of attribution theory, but they have been investigated across several disciplines.

Research has revealed that attributions of causality (or responsibility) are subject to numerous distortions (Burger, 1981). Several proposed sources of these distortions have emerged, including a biasing of perceptions of causality to satisfy the perceiver's personal motivations. The role of personal motivations in causal attributions has been outlined theoretically (e.g., Heider, 1958; Kelley, 1971) and motivational explanations have been applied to the perception of responsibility for events such as natural disasters, disease, crime, and accidents. Assigning responsibility for an outcome involves judgments about moral and legal accountability. Although many researchers have, since the 1970s, used attribution terminology and frameworks in such research, social psychologists dating back to the 1920s have been interested in understanding the circumstances in which people are seen as responsible (Frieze et al., 1979). Blame attributions have been studied heavily in the health and welfare-related fields. In particular, common research areas have included sexual assault, addictions and addiction-associated behavior, product harm, and marital violence (Gerber and Cherneski, 2006; Laufer and Coombs, 2006; Richardson and Campbell, 1980; Andrews and Brewin, 1990).
While these research areas are dissimilar in subject to that of a natural resource management problem, the findings have implications that are of interest to the proposed research. For example, Gerber and Cherneski (2006) highlighted differences in attributions of sexual assault amongst members of different groups (gender). Specifically, they invoke Shaver’s (1975) defensive attribution theory, which posits individuals tend to blame others more when they see themselves as dissimilar to those others. Defensive attribution is based on the premise that individuals are concerned about their own well-being and that blaming other individuals, groups, or organizations for a negative outcome serves as a coping mechanism. Strong support has been found for the defensive attribution hypothesis (Robbennolt, 2000). Certainly this may be the case amongst different natural resource management stakeholder groups, especially in consumptive versus non-consumptive activities.

Laufer and Coombs (2006), in a review article, describe why it is important for corporations to understand how consumer segments (defined as groups of consumers that share similar needs) differ in their assignment of blame in the event of a product harm crisis. Specifically, Laufer and Coombs question whether these consumer groups will blame differently, thereby requiring a differential corporate response. The authors also utilize defensive attribution theory to examine the perceived severity of events. Here they predicted that incidents which result in more severe outcomes will also result in the consumer apportioning more blame to a potentially responsible party. One implication of this research is that communication directed at various groups may have to be quite nuanced, especially in cases where the problem has caused disproportionate harm.

Many of the examples above suggest that individuals’ perceptions of events and their causes can often be distorted. In these cases, a person might consider himself or his group to be dissimilar to the perceived “perpetrator(s)” and thus would not have acted similarly. This view is supported by findings which indicate that in cases of subject-other similarity, the subject will be more inclined to attribute the outcome to chance or luck rather than to assign blame to the similar
other (Burger, 1981; Chaikin and Darley, 1973). With regard to evading harm or blame, these findings clearly highlight the importance of personal motivation in the distortion or biasing of attributions.

Consequences of Attributions of Responsibility

Finally, within the rubric of causal attribution studies, and especially those of attributions of responsibility, investigators are paying increasing attention to how people act upon the judgments they have made. While antecedents of attributions, such as complexity of thought, are important, many social endeavors are affected most directly by the consequences of an attribution. However, attributional consequences have historically been examined less often than antecedents of attributions and attributions themselves are not a focus of this dissertation. Nevertheless, it is often the case that policy-makers and others are interested in the behavioral consequences of attributions of responsibility. In fact, some models, such as Weiner’s, consider causal attributions themselves to be only of importance as modifiers of behavior (McAuley et al., 1992). Therefore, a brief discussion of attributional consequences is appropriate.

Though it has been less studied, literature on attributional consequences does exist. For example, Key (1966) articulated a reward-punishment model of economic voting that views the electorate as a homogenous voting bloc, rationing out rewards and punishments to incumbents on the basis of to whom they attribute national economic performance (e.g., the president). Subsequent studies, however, have found that the voting block is not homogenous, as a variety of individual differences condition these evaluations (Rudolph, 2003). In a recent study, Rudolph (2003) examined the consequences of attributions in terms of presidential and congressional approval/disapproval ratings with regard to the economy. He found that the effects of an individual’s perceptions of the economy on congressional approval were strongest when an attribution of congressional responsibility for the state of the economy was made. He also found a similar pattern in presidential approval, but also that the president received some benefit
regardless of whether a healthy economy was attributed mostly to Congress. Rudolph’s results suggest that it is reasonable to assume that when the public attributes responsibility for a problem to an entity (Congress) or person (the president), a result is lower public confidence in the decision-making capabilities and credibility of that entity or person.

Similar to Rudolph, Iyengar (1989) examined the effect that attributions of responsibility for public security and social welfare issues have on subsequent public opinions. Iyengar found the effects of causal attributions on opinion to be highly robust. For example, those who felt that society (rather than the individual) was causally responsible for poverty were more likely to be critical of the president and business leaders and more likely to oppose more defense spending. If this finding was to applied to a resource management regime, it may mean that stakeholders who find themselves and others not to blame will be more tempted to attribute responsibility to the political leadership (both elected and appointed) of relevant management agencies rather than the staff who conduct much of the actual management work, such as analysts and program managers.

**Attribution Research in Natural Resource Management and Natural Disasters**

Within the context of natural resource management, very little attribution work has been published to date, which is somewhat surprising given that a number of management scenarios are conducive to blaming and subsequent behaviors (e.g., over-harvest of commercially or recreationally valuable species, ecosystem degradation, loss of wetlands, coastal or riverine pollution). One area of the field that has received some (minimal) attributional attention is causation of wildfire damage.

**Wildfire**

Wildfire is a contentious natural resource management issue that often pits segments of the public against resource managers, especially in the American West (Busenberg, 2004). Kumagai and colleagues (Kumagai et al., 2004) used a mixed-method approach to understand the
attribution process of those who have and who have not experienced wildfire in terms of who/what is to blame (others, self, and nature) for damage from wildfires. While little support was found for their hypotheses, their research represented an initial foray of attribution research into natural resource management, involved a triangulation approach to data collection, and utilized innovative methods for collecting data about causal attributions.

The Kumagai et al. study is rooted in external versus internal attribution research. As such, the authors observed that there are three broad categories of attributions people can make with regard to the cause of destructive wildfire: themselves, other people, and nature. Hypothesis formation was based on the internal/external nature of attributions that people would make about the causes of destructive fires based on their experience with wildfire. Responses to a survey question allowed the researchers to segment people into groups based upon their wildfire experience: no wildfire experience (NWE), past wildfire experience (PWE), and recent wildfire experience (RWE). In line with concepts drawn from internal/external causal attribution, Kumagai et al. developed three hypotheses. These hypotheses examined how respondents’ evaluation of blame changed based on their experience with wildfires. Specifically, the authors hypothesized that 1) people who have experienced wildfire would be more likely than those without wildfire experience to blame fire damage on the actions (or inactions) of other people, 2) people who have experienced wildfire are more likely to blame man than nature than are people without wildfire experience, and 3) people who have experienced wildfire are less likely to blame themselves for damage than are people who have not experienced wildfire. These attributional hypotheses that predict less self-blame are in line with the tenets of causal attribution theory. An enduring finding in social psychology is that individuals tend to attribute their own failure (in this case fire damage) to uncontrollable external factors, while attributing successes to internal factors (Fiske, 2004). This is known as the Fundamental Attribution Error.

Kumagai et al. found that while respondents with no wildlife experience generally attributed the cause of wildfire damage to others’ actions, those with previous wildfire experience
were even more likely to do so. Respondents with recent wildfire experience attributed the cause of wildfire damage to nature more than did those with no wildfire experience, perhaps because people with no wildfire experience are still open-minded about issues of blame. Finally, respondents with recent wildfire experience and no wildfire experience attributed almost equal percentages of the cause of wildfire damage to their own actions as did those with and previous wildfire experience. The authors also found that regardless of wildfire experience, people were less likely to hold internal attributions (i.e., hold themselves responsible) for wildfire damage since in all categories survey respondents listed their own actions as having the potential to cause or increase wildfire damage least frequently among the choices.

Attribution has also been utilized as a conceptual framework in political science research that has examined attributional processes associated with natural disasters, which often have natural resource management aspects. Attribution theory has been deemed important in the political realm because, among other things, a citizenry capable of fully and meaningfully participating in democratic government is better able to properly ascribe credit and blame for the actions of its leaders (Gomez and Wilson, 2008). Attribution studies associated with natural disasters are few, however – mostly because such events themselves are relatively rare (Arceneaux and Stein, 2006). Below are presented several studies in the literature that examined natural disasters from an attributional perspective.

**Hurricane Katrina**

The destruction Hurricane Katrina caused in 2005 has provided a good case study of political blame following a natural disaster and several studies have already been published as a result. Gomez and Wilson (2008), for example, conducted a telephone survey of a sample of Louisiana residents using random digit dialing to examine the attribution of blame for the magnitude of the damage inflicted on Louisiana. Their study used an explanatory variable – a measure of political sophistication – as a means of comparing attributions across groups.
Political sophistication is a measure of political awareness or knowledge and is typically measured by a battery of questions designed to measure one’s knowledge of politics. Higher levels of political knowledge have been shown to correlate with how individuals attribute political blame (Sniderman et al., 1991).

Gomez and Wilson found that individuals with higher levels of political sophistication were more likely to equitably apportion blame amongst local, state, and federal officials, whereas those with lower levels of political sophistication disproportionately blamed the president. This study employed a variant of the close-ended question format typical of attribution surveys. Rather than presenting respondents with a list of actors/causes from which they may select one or more, the authors presented respondents with five different actors (President Bush, Louisiana Governor Kathleen Blanco, New Orleans Mayor Ray Nagin, local parish leaders other than the Mayor, and FEMA) and asked respondents to indicate whether each was responsible for “a lot of the problems, some of the problems, a few of the problems, or none of the problems” associated with hurricane relief effort. Gomez and Wilson were also interested in respondents’ unguided and unprompted attributions of responsibility and included in their survey an open-ended question asking respondents to indicate who they thought was most responsible for the delay in relief to New Orleans. In the open-ended format, nearly one quarter of respondents blamed Louisiana Governor Kathleen Blanco (Figure 4).
Answers to the close-ended question about whom were to blame were less dispersed because fewer options were available for respondents to select. In many ways, first responses to the open-ended question paralleled responses to the close-ended questions. However, there was one important difference. In the close-ended format, FEMA was viewed as being primarily responsible, with nearly half the sample holding it responsible for “a lot of the problems” (Figure 5). It seems that many in Louisiana viewed FEMA negatively, but this did not show up in most surveys without prompting. Gomez and Wilson see this disparity as an important reason to use both open-ended and closed-ended items as a way to get a complete picture of causal attribution.

Figure 4. Tally of first responses to Gomez and Wilson’s (2008) open-ended attribution question. Source: Gomez and Wilson, 2008.
Figure 5. Tally of responses to Gomez and Wilson’s (2005) close-ended attribution of responsibility of the severity of hurricane damage question. Source: Gomez and Wilson, 2008.

The implications of this study for the proposed project are straightforward. Any group of people can be arranged on a continuum of political awareness, from least to most. Their subsequent evaluations of political responsibility for a natural disaster are influenced by level of political awareness, which is illustrated as a point on the continuum. These evaluations, in cases where they can be acted upon (e.g., by voting), have great potential to affect local, state, and even national political landscapes. Therefore, understanding what percentage of the electorate in a region falls into different levels of political sophistication could influence the way in which elected officials shape policy towards natural disaster response, or, at the least, what types of information (e.g., exactly who is responsible for what in the aftermath of a hurricane) these officials would like to communicate to the public ahead of and following such a disaster.

In another Katrina-related attribution study, Malhotra and Kuo (2008) examined the relationship between political partisanship and blame attributions by manipulating the
information given to survey respondents regarding party affiliation and office title of potentially-blamable officials. The survey was Internet-based, using a nationally-representative sample of 397 adults. In this experiment, Malhotra and Kuo respondents ranked seven public officials in order of how much they should be blamed for the consequences of Hurricane Katrina in the city of New Orleans. Of these seven officials, three were Democrats (Louisiana Governor Kathleen Blanco, New Orleans Mayor Ray Nagin, and Louisiana Senator Mary Landrieu) and four were Republicans (Federal Emergency Management Agency Director Michael Brown, President George W. Bush, Secretary of Homeland Security Michael Chertoff, and Louisiana Senator David Vitter).

The respondents were randomly assigned to one of four experimental groups, which differed along two dimensions. The control group only received the list of seven proper names without any additional information. Group 2 received the list of proper names with each official’s partisan affiliation. Group 3 received the list of proper names with each official’s job title. Finally, Group 4 received the list of proper names with each official’s partisan affiliation and job title. For all respondents, the order of the names on each list of officials was randomized.

The main dependent variable in the Malhotra and Kuo study was the blame ranking assigned to each public official by the respondent. Respondents were asked who they thought was most to blame, followed by the list of seven officials. After selecting an official, respondents were then asked who they thought was second most to blame, and so on until the list was exhausted.

The Malhotra and Kuo study shed light on heuristics (snap judgments) in the post-hoc evaluation of government performance. Their findings indicate that people use partisan cues to blame officials to some extent but that they also use information about officials’ responsibilities to make more principled attributions. Specifically, Malhotra and Kuo found that Democrats attributed most blame to President Bush, with 65.5% of respondents saying he was “most to blame” and blamed Senator Landrieu and Governor Blanco, both Democrats, least. The average
blame ranking for Bush was significantly higher than the second most blamed official, FEMA Director Brown. However, despite his second place ranking, Brown (and Secretary Chertoff) was nonetheless blamed highly by Democrats. Among the least-blamed officials was Senator Vitter, perhaps because he is a legislator and therefore had little executive decision-making authority or because of low name recognition nationally.

Republicans, on the other hand, blamed Democratic Mayor Nagin most, though many also found President Bush most to blame. Such findings, the authors state, may help to explain the deterioration of Bush’s approval rating after the storm. A number of Republicans also found that FEMA Director Michael Brown most to blame, and he may have been used as a scapegoat, as he was dismissed by Bush shortly after the storm and hence became an easy target for Republicans to use to shift blame away from the Administration.

Obviously, these findings are not overly surprising. However, they do imply that partisanship is a strong predictor of patterns of attribution. When individuals self-identify with a group, they exhibit a common tendency to assign primary blame for failures to other groups (Fiske, 2004). In addition, these failures are seen in terms of internal factors rather than external factors. For example, failure is often seen as a result of incompetence. This finding is similar to that of other attribution studies (e.g., Peterson et al., 1982) that found people tend to explain bad events as external. This finding is of importance to the proposed study because they point to the potential for stakeholder groups to assign causal responsibility for a problem to others, despite evidence to the contrary. Thus, efforts that rely on the communication of “objective truth” may fall short because of the role of perception in attribution.

**Tropical Storm Allison**

Areceneaux and Stein (2006) conducted a study to better understand attribution of blame for the consequences of natural disaster as political variables. Here the authors crossed political knowledge (i.e., political sophistication) and personal experience (how severely the respondent’s
neighborhood was flooded) with causal attributions of flood damage resulting from Tropical Storm Allison’s deluge of the Houston, TX area in 2001. Arceneaux and Stein point out that assessing natural disasters as political variables is a ripe field of inquiry, as the only previously published study concerned a hurricane in the 1960s (Abney and Hill, 1966), which predates the methods and approaches associated with recent advances in attribution theory research (and thus will not be reviewed here).

This research was conducted using a telephone survey of registered Houston voters. Attribution questions were posited as a battery of questions that measured citizens’ perceptions of who were responsible for flood preparedness in the city. All respondents were first asked to evaluate whether government policies had made their neighborhood more or less prepared for flooding. Respondents who said ‘‘less’’ were defined as attributing blame. Respondents who gave either the ‘‘more’’ or the ‘‘less’’ response were then asked to indicate which level of government they credited or blamed for the quality of flood preparation in their neighborhood (national, state, county, city, or an interviewee-specified other). If a respondent volunteered that government policies have no effect, he was then asked to clarify this statement. For example, no effect might mean that the respondent feels that government policies have been not been adequate, which is a form of blame attribution. However, it may also mean that he believed government policies simply did not matter in terms of making his neighborhood more or less prepared for flooding because of uncontrollable factors (e.g., topography). Those individuals who said that the government did not do enough were then asked to indicate which level of government they believed was responsible for the lack of flood preparation.

Arceneaux and Stein found that citizens seem to be willing to hold elected officials accountable for natural disasters if they perceive the government could have done more to mitigate the disaster: respondents who attributed flood damage responsibility to the city government reported that they were on average 10% less likely to prefer the incumbent mayor of Houston, who was running for reelection at the time. Those who blamed a level of government
other than the city were neither more nor less likely to prefer the mayor. They also found that Houstonians who were living in neighborhoods that were greatly affected by the flood (personal experience) were more likely to blame, but not credit, all levels of government. With regard to the effects of political knowledge, the data also showed that respondents who hold higher levels of local political sophistication were more likely to attribute responsibility to the county rather than the city for flood preparation. It is probable that this result was due to the fact that those individuals were more aware that the county was functionally responsible for flood control policy.

The Arceneaux and Stein findings illustrate the lose-lose situation in which resource managers often find themselves. For example, regulation of the resource over time can often lead to feelings of resentment by both commercial and recreational groups. However, following a disaster (e.g., a fishery collapse), some of the same individuals that first resented government intrusion subsequently find themselves attributing the cause of the disaster to a lack of government action. For example, Holmes (1994) writes that many fishermen were inclined to blame a regulatory bureaucracy that was slow to act for the collapse of the northern cod. It would thus seem that research using a hypothetical approach in which respondents are asked to assign causation for a fictitious problem could be an interesting and applied use of attribution theory in natural resource management human dimensions studies.

**East Cape Earthquake**

Finally, McClure et al. (1999) report on two studies that used Kelly’s (1967) ANOVA Model to understand how residents of Wellington, New Zealand attributed causation for earthquake damage. Specifically, their research hypothesized that when earthquake damage to a particular building is distinctive in relation to comparable buildings, people will attribute the outcome to the factor that is also distinctive and often preventable (such as substandard construction or poor site location). The authors note that these concepts normally apply to human
action, but may be transferable to physical causal factors such as earthquake magnitude and building design. As predicted, McClure et al. found that participants judged distinctive damage to be more preventable.

**Cognitive Style and Complexity**

**Background**

While research into attributions themselves elucidates what people are thinking about an issue, attributions on their own tell us relatively little about how people think about an issue. The term “cognitive style” refers to how people think about, perceive, and remember information. Various related definitions have been proposed for the construct. Liu and Ginther (2002) propose a concise and comprehensive definition: “an individual’s consistent and characteristic predispositions of perceiving, remembering, organizing, processing, thinking, and problem-solving.” Foundational work for cognitive style can be found in Kelly’s (1955) Personal Construct Theory, with his concept of classifying individuals’ personal constructs or cognitive structures. Kelly emphasizes a theory of how individuals make sense of the world, and how these schemas change over time and uses this approach to postulate that the way in which a person construes his personal world is directly related to his personal identity. Kelly thus established the “cognitive approach” in psychological research.

At about the same time Kelly was developing and refining his Personal Construct Theory, Bieri (1955) introduced the concept of cognitive complexity-simplicity as a psychological characteristic or variable that indicates the complexity or simplicity of a person’s frame and perceptual skill. A person who scores high on a cognitive complexity exercise tends to perceive the nuance and multifariousness of higher-level problems and is more complex in his approach to solving those problems. Bieri’s measurement of complexity-simplicity examined the organization of constructs and their similarity, though his initial bipolar terminology has been overtaken by the simpler term ‘cognitive complexity.’ The distinction has also been reinterpreted
by others, and this changing of labels has created some confusion in the literature as to whether the same constructs were being examined and measured under different names.

Two measures are primarily associated with Bieri’s initial model: the Driver Decision Style Exercise, a mini case problem-solving approach that taps people’s mental operating style, and the Complexity Self-Description Instrument, a paragraph completion test. Both of these instruments are somewhat ad-hoc, however, and are thus little used at present; Carey (1991) describes both as instruments that measure perceived style rather than actual style.

There have been a number of alternative methods for generating a cognitive complexity index. Bannister (1960) conceived an average correlation measure, while other approaches include the percentage of variance accounted for by the first principal component of construct correlations, an adaptation of the matching approach devised by Landfield (Landfield and Cannell, 1988) known as the ‘functionally independent construct’ or FIC index, and the use of analysis of variance approaches (Vannoy, 1965; Bell and Keen, 1980). Cognitive complexity has also been calculated from Crockett’s Role Category Questionnaire (Crockett, 1965), where cognitive complexity is inferred by the number of independent constructs produced. This is similar to a measure of self-complexity used more generally in social psychology (Rafaeli-Mor et al., 1999).

Both Kelly and Bieri likely found inspiration for their work from the political philosopher Isaiah Berlin, who published an essay in 1953 entitled “The Hedgehog and the Fox: An Essay on Tolstoy’s View of History.” Borrowing from the ancient Greek poet Archilocus, Berlin argued that hedgehogs know one big thing and apply that one thing everywhere. In addition, they tend to express much confidence in their own views while simultaneously dismissing opposing viewpoints. Foxes, in contrast, tend to know many things, Berlin wrote. They are far more likely to consider multiple competing views, make bottom-up inductive arguments from an array of facts, and are cautious when presented with “Big Ideas.” At one extreme, “hedgehogs seek certainty and closure, dismiss information that undercuts their preconceptions and embrace
evidence that reinforces them, in what is called ‘belief defense and bolstering.’ At the other extreme, “foxes are cognitively flexible, modest, and open to self-criticism” (Begley, 2009).

Cognitive Sophistication

Related to cognitive complexity is cognitive sophistication, which Glock et al. (1975) approached in terms of three attributes: intellectual interests, openness to new ideas, and willingness to risk uncertainty and ambiguity. A review of the literature finds few studies that have used the term cognitive sophistication to characterize the complexity of thought. In a notable example, Bobo and Licari (1989) tested the effects of education and cognitive sophistication on political tolerance. Their measure of sophistication was the number of correct answers to a ten word vocabulary test, after Krosnick and Alwin (1987). The investigators chose to operationalize cognitive sophistication in this way because the literature indicated that a rich vocabulary is often indicative of sensitivity to new information and an ability to reorganize ideas in more complex ways as situations demand. In addition, vocabulary is considered by some to be an excellent measure of intelligence and has been included in many assessments of intellectual functioning (Thorndike and Gallup, 1944; Zimmerman and Woo Sam, 1973).

Bobo and Licari first developed a scale of political tolerance. Second, they tested the cognitive sophistication hypothesis in a multiple regression framework using a Civil Liberties Scale that incorporated five different groups spanning the political spectrum. Finally, they tested for education and cognitive sophistication effects on tolerance of four separate target groups among those respondents holding explicitly negative attitudes toward the target group. The principal relevant finding of this research was that cognitive sophistication explained a substantial amount of the variance regarding the effect of education on tolerance. The authors conclude that these findings provide confirmation of the role of cognitive sophistication on willingness to support the rights of disliked groups.
Explanatory Complexity

Like cognitive sophistication, explanatory complexity is also a term for cognitive style that is used infrequently. In fact, its use is limited, it would appear, to one study that examined the use of causal models to explain perceptions and attributes of damage following an earthquake (McClure et al., 1999). No concise definition for the term is provided by the authors. Rather, they describe the concept in more general terms as complexity of knowledge, an independent variable that may predict or correlate with other psychological responses, such as attribution. This complexity was observed as the totality of a person’s knowledge of the effects of hazards, such as earthquake magnitude and proximity, building structure, and soil type. Persons with less knowledge (i.e., less explanatory complexity) would be expected to be less aware of factors that mitigate damage, and thus may see damage as less controllable.

McClure et al. operationalized explanatory complexity in two ways using two samples. Respondents in the first sample (residents) were asked to write about causes for earthquake damage in an open-ended response. An explanation that cited a single cause was classified as simple and complex if it cited more than one cause. A total of 26% of the explanations cited more than one cause. Respondents in the second sample (students) were provided with a structured measure to reduce the subjectivity and increase the reliability of the results. The structured measure had three options: earthquake strength, building design, and the combination of earthquake strength and building design. Findings indicate moderate, but statistically significant, correlation between complexity and global damage: participants with more complex models judged global damage to be more preventable.

McClure et al. interpret their findings as suggestive that people with both simple and complex models of earthquakes attribute distinctive damage to the design quality of the damaged structure instead of simply to strength of the earthquake. Thus, they found no relationship between explanatory complexity and judgments that distinctive damage is preventable. However they did observe a potential relationship between explanatory complexity and perceptions of
global damage: people with more complex models of earthquakes were more likely to recognize that even when most of the buildings in a city collapse, such damage might have been preventable. These results indicate that efforts to increase explanatory complexity may help people to recognize the range of causes that contribute to damage.

**Integrative Complexity**

Integrative complexity (IC) is also a measure of cognitive style. Originally used to evaluate pre-existing political speeches (Tetlock, 1989), the construct is now employed in various disciplines, such as psychology and conflict resolution. It is an issue-specific measure of human information processing and decision-making that can be used to describe the structure of thought, over and above the content, regarding dichotomous issues. Specifically, integrative complexity is concerned with a person’s capacity and willingness to acknowledge the legitimacy of competing perspectives on the same issue (differentiation) and his ability to forge conceptual links among these perspectives (integration) (Suedfeld et al., 1992).

Integrative complexity relies largely on evaluating the number of aspects to a problem that people recognize and consider (Tetlock, 1989). People with high integrative complexity take diverse approaches in evaluating a situation and making decisions, and those with low integrative complexity rely on simplistic and dichotomous reasoning (Koo et al., 2002). Thus, people can be described as having higher integrative complexity when they are able to think about an issue at an abstract level of analysis and along multiple dimensions, and lower integrative complexity when they remain dogmatic (Tetlock, 1998).

Integrative complexity is comprised of two components: differentiation and integration. This suggests that the construct was heavily influenced by previous theorists; Kelly’s (1955) cognitive complexity / cognitive simplicity theory concerns in part the degree to which a respondent differentiates perceived elements in a given situation, and Crockett (1965) describes cognitive style in terms of differentiation and integration. In recent usage of the construct, high
differentiation exists when a person considers an extensive range of relevant facets, characteristics, or factors when thinking about an issue, event, or outcome, and employs various methods to evaluate and interpret it. High integration exists when the person is able to conceptualize the complex linkages among and between the differentiated facets, characteristics, or factors of an issue (Harvey et al., 1961; Schroder et al., 1967). For example, environmental degradation is unlikely to be due solely to any one cause. Rather, it is the cumulative result of a variety of factors. A person who acknowledges this variety of factors and understands how these factors are interlinked would have a much higher integrative complexity score than would someone who thinks that addressing just one factor would be sufficient to solve the problem.

Integrative complexity analysis is most often based on responses to an essay question (a.k.a., paragraph completion test). Coders are trained in analysis procedures (e.g., the Conceptual Integrative Complexity Scoring Manual (Baker-Brown et al., 1992)). A score of 1 reflects a low level of differentiation and integration. That is, the respondent did not provide evidence that he recognized the potential for more than one dimension to that issue. A score of 3 represented a moderate-to-high level of differentiation but low integration. In this case, the individual clearly articulated at least two ways of looking at the issue but did not recognize the connection between the two. A score of 5 suggests moderate to high differentiation, as well as moderate integration. Here, the person notes the conceptual connections between several dimensions of an issue and explicitly discussed integrative links between those dimensions. Finally, a score of 7 indicates both high differentiation and high integration, as the respondent is seen as conceptualizing overarching principles that connect the dimensions.

The paragraph completion test procedure is onerous, however; respondents must write a paragraph describing their attitudes and beliefs about a given issue and several trained raters subsequently have to evaluate the essay, and reach consensus on those evaluations, on a seven-point scale.
The paragraph completion test has obvious disadvantages in mail surveys, where response rates are an important consideration (Bright and Barro, 2000). In addition, when administered in a mail format, the investigator must trust that the respondent understands that to be scorable, the essay needs to include opinions, valuations, or judgments about the issues (Bright and Barro, 2000). A simple, descriptive account is not useful (Baker-Brown et al., 1992).

To address these issues, Carroll and Bright (2006) developed and validated a fixed-item scale approach to measuring integrative complexity. They point to the following as potential advantages of a scalar measure of integrative complexity:

1. yields a higher response rate;
2. enables the concept to be used in more broad social science studies;
3. provides for larger sample sizes, which would allow for generalizability to a population;
4. makes the scoring more quantifiable and overcome the challenges associated with translating qualitative data into quantifiable measurement; and
5. allows for the concept’s use in theoretical models of attitudes and behavior.

The reader will recall that integrative complexity is comprised of two dimensions: differentiation and integration. In order to measure differentiation, Carroll and Bright first had respondents list arguments for and against wildfire management techniques. Like the traditional essay method, this process indicated the number of positive and negative aspects that respondents were thinking about. Differentiation scores were reported as being between zero and one, and were arrived at by summing the number of for and against arguments and dividing the lesser by the greater. A value of below .5 reflects less differentiation, while a score greater than .5 reflects more differentiation. For example, an individual who lists four arguments for and six arguments against a management technique has a ratio of 4 to 6 and a differentiation score of 0.67.

To measure integration, respondents were asked to indicate how they felt about the strength of each argument they listed. If an individual gives a for argument the same value as an against argument, this suggests the individual recognizes similar value to both sides of the
argument. This in turn is an attribute of higher integration. Carroll and Bright calculated an integration score by assessing the means of the strengths of the arguments for and the arguments against the issue and divided the smaller mean by the larger. To continue the previous example (where an individual listed four arguments for and six arguments against): if the four arguments for were considered to be strong arguments (e.g., 6, 6, 7, 7), the mean would be \((6 + 6 + 7 + 7)/4\), or 6.5. If the six arguments against were perceived to be weak (e.g., 2, 2, 2, 3, 3, 3), the mean would be \((2 + 2 + 2 + 3 + 3 + 3)/6\), or 2.5. Therefore, the integration score for this respondent would be 2.5 / 6.5, yielding an integration score of 0.4. Again, the scale is between 0 and 1 and a value of below .5 reflects less integration, while a score greater than .5 reflects more integration.

To be of value, the differentiation and integration scores must be combined to obtain an overall integrative complexity score. Carroll and Bright did this by multiplying the two individual scores. This calculation will result in a value between zero and one: the integrative complexity score of the hypothetical individual in the above example would be 0.67 x 0.4, or 0.27.

The above approach attempts to remove much of the subjectivity and work involved in measuring integrative complexity. However, there still remains the issue of asking the respondent to think about and write arguments for and against the topic of interest. This task may still be cumbersome for the respondent and consequently may lower response rates and data quality.

Integrative complexity has been applied to a variety of issues, including military leadership, authoritative thinking, groupthink, leadership thinking during crises, and personality (Suedfeld et al., 1986a; Suedfeld, 1986b; Wallace and Suedfeld, 1988; Suedfeld et al., 1992; Coren and Suedfeld, 1995; Tetlock, 1981; 1989), as well as nuclear weapons (Kristiansen and Matheson, 1990) and abortion (Dillon, 1993). However, some of the best known work on integrative complexity has been applied in the realm of political science, where it has been employed to measure differences in liberal and conservative thinking on issues. For example,
Suedfeld et al. (1994) found that combined integrative complexity scores differed among two pragmatic versus two ideological groups. In that research, members of two political parties that were viewed as more pragmatic scored higher in integrative complexity than members of two political parties that were seen as being more ideological. Implications of this finding for the proposed study include the idea that individuals who identify themselves as being dedicated to ecological preservation or, at the other end of the continuum, to exploitation, may be more likely to have lower levels of integrative complexity and may therefore be less likely to fully comprehend opposing arguments that include complex reasoning.

In other research conducted by Suedfeld et al. (1986a), the investigators studied Civil War leadership in specific battles. These authors concluded that a pattern emerged whereby higher levels of integrative complexity (as exhibited by commanders) were positively correlated with the defeat of superior opposing forces. This finding suggests that higher levels of integrative complexity are desirable in leadership positions, be they in the military, politics, or resource management agencies.

**Integrative Complexity of Groups**

This study examined the integrative complexity scores of pre-selected groups, since management decision-making is heavily influenced by and oriented towards communities of common interest. Thus, a review of the (minimal) literature associated with group integrative complexity is in order. As Suedfeld et al. (1994) note, the cognitive complexity of political groups, such as political parties, has previously been subjected to debate. For example, Suedfeld and Epstein (1973) described an association between conservative positions and simple information processing.

Outside of the political arena, fewer studies of group integrative complexity exist. In one notable study, Gruenfeld and Hollingshead (1993) compared the integrative complexity of essays created by groups to those completed by individuals over the course of ten weeks. Each week,
individuals first wrote independent essays and then collaborated to create a single group essay. During the first five weeks of the exercise, the group score was not significantly different from that of average individual scores, although group essay scores were significantly lower than those of essays written by individuals in the group with the highest complexity scores. During the remaining five weeks, Gruenfeld and Hollingshead found the scores for group integrative complexity increased at a greater rate than either the average or highest individual complexity levels. In the end, group scores became significantly greater than that of the average individual and statistically equivalent to that of the highest member. Though the present study will not study groups of people in the same way (i.e., as a collaborative), the Gruenfeld and Hollingshead findings provide justification for focusing on, and expanding the research of, group integrative complexity, since their findings suggest that groups may differ from individuals in terms of the complexity they employ to evaluate an issue.

In another group complexity study, Gruenfeld et al. (1997) observed in an experiment that the communications of majority groups (e.g., Democrats in that Congress) exhibited greater integrative complexity scores than those of minority groups. The authors suggest that these findings are a consequence of minority influence and its impact on cognitive flexibility. In other words, in the presence of a minority group, especially one that is vocal in its opposition, the reaction of the majority group is to go further in explaining its choice rationale – which subsequently positively impacts integrative complexity scores. This finding highlights the potential importance of dissention in reaching better decisions.

**Integrative Complexity and Resource Management**

To date, integrative complexity has been used very little in the natural resource management field to understand psychological variables. The following studies represent most, if not all, of the extant relevant literature on integrative complexity and related measures in the natural resource management arena.
In a study that examined attitudes, objective knowledge, and environmental ideology regarding protecting plant and wildlife species in Illinois, Bright and Barro (2000) found low levels of integratively complex thinking with regard to plant and wildlife protection among a stratified random sample of 400 residents of Illinois (stratification ensured an adequate representation of urban and rural residents in the sample). Integrative complexity was measured via a paragraph completion test, per the typical qualitative approach. Respondents were asked: Should we continue to spend time and money protecting the diversity of life and variety of natural habitats on earth even though such protection can, in some instances, conflict with other economic, recreational, and private uses of these areas? The answer was required in essay format and respondents were asked to explain their position. Essays were scored on a scale of 1 to 7 by trained coders (see above discussion about IC scoring for more detail). Bright and Barro hypothesized that:

1. no relationship would be found between the direction of one's attitude and integrative complexity;
2. individuals with moderate attitudes toward plant and wildlife species protection would exhibit higher levels of integrative complexity than individuals with extreme attitudes;
3. a positive relationship between knowledge about plant and wildlife species protection and integratively complex thinking would be observed; and
4. a significant relationship would be found between one's environmental ideology and integratively complex thinking.

They found that attitude direction was not significantly related to integrative complexity as a main effect or interaction. However, the attitude-extremity and objective knowledge hypotheses results were more complex. A significant interaction was observed between attitude extremity and objective knowledge. Consistent with the relationship proposed, integrative complexity was negatively related to attitude. However, this finding held only for individuals
with high objective knowledge about plant and wildlife species protection (a finding that was consistent with the hypothesis that a positive relationship between knowledge about plant and wildlife species protection and integratively complex thinking would be observed). There were no differences in integrative complexity across attitude-extremity levels for respondents with low or moderate knowledge. Therefore, some support was found for hypotheses 2 and 3.

A second study that used integrative complexity was Bright and Tarrant’s (2002) study of attitudes towards the Endangered Species Act (ESA). Here the authors engaged a sample of university students to explore integrative complexity about the ESA in order to understand the connection between complex thinking and several characteristics of attitudes. Bright and Tarrant’s integrative complexity-based objectives were to examine the:

1. level of integrative complexity related to the ESA;
2. relationship between integrative complexity and the direction of attitudes toward supporting the ESA;
3. relationship between integrative complexity and the ambivalence of attitudes toward the ESA;
4. relationship between integrative complexity and the importance of the individual’s attitude toward the ESA; and
5. effect of environment-based coursework on integrative complexity.

Integrative complexity was assessed via a paragraph completion test and scored per Bright and Barro (2000). Students were asked to discuss key dimensions of the issue, their attitude toward that issue, and why they held that attitude. The research found that the overall sample exhibited relatively low integrative complexity (2.26 on a scale of 1-7, $SE = .27$). According to Baker-Brown et al. (1992), a score of 2 suggests that an individual recognizes the potential for looking at an issue in different ways but is unable to clearly discuss the issue. In Objective 2, no statistically significant difference was found and the investigators concluded that
no relationship existed between the complexity of thinking about the ESA and the direction of one’s attitude toward it. In Objective 3, respondents who held moderate attitudes showed significantly higher integrative complexity toward the ESA than did those with extreme attitudes. In Objective 4, attitude ambivalence was significantly and positively related to higher levels of integratively complex thinking about the ESA: those with more ambivalent attitudes also scored higher in IC score. In Objective 5, Bright and Barro found no significant difference in integrative complexity between respondents with low attitude importance and high attitude importance. In the final IC objective, the investigators examined the effect of environment-based coursework on integrative complexity. Pre-semester and post-semester IC tests were administered to a control group and a group of students taking an environmental management course. Results indicate that within the treatment group, the level of integrative complexity increased significantly from a pre-semester mean of 2.24 (SE = .26) to a post-semester mean of 3.83 (SE = .25). The level of IC toward the ESA within the control group increased only slightly, from a pre-semester mean of 2.27 (SE = .31) to a post-semester mean of 2.69 (SE = .32).

A key implication of this research for natural resource managers is that it contradicts the often-held assumption that positive attitudes about environmental protection can be generated simply by increasing a person’s knowledge about environmental processes. Rather, these findings indicate that environmental education that aims to teach people to think critically about the environment will likely have a much greater effect beyond persuading people to take on positive environmental attitudes. The resource management profession stands to gain by applying such findings. By eschewing the traditional biocentric value/conservation communication approach, attitude and behavior change goals may be easier to achieve.

A third natural resource management integrative complexity study is Carroll and Bright’s (2010; 2006) use of IC to examine wildfire management. The authors used this controversial issue to develop and test an integrative complexity scale that addresses the problems associated with the qualitative, lengthy, and laborious nature of typical IC measurement. Their paper
presents the process of developing a combination of open-ended questions, a fixed-item scale, and a measurement of the complexity of thought that is consistent with integrative complexity. To test the new scale, Carroll and Bright used 72 undergraduate students who were randomly placed into one of two groups: prescribed burning group and a mechanical thinning group. These groups represented the issue about which they would be writing. Half of the respondents within each group were asked to write an essay about their assigned topic, while the other half completed the scale about that topic. After finishing this task, those in the essay group were asked to complete the scale, while those in the scale group completed the essay portion. This exercise produced 63 usable essay–scale pairs for the two issues: 33 for prescribed burning, and 30 for mechanical thinning. The development of the quantitative scale is described in more detail elsewhere in this dissertation.

Carroll and Bright found a strong correlation between the scale and essay results for both the prescribed burning and mechanical thinning issues. However, despite this strength, the authors conclude that their scale did not exactly measure integrative complexity, but rather a measure that seems to reflect the results obtained from traditional integrative complexity methods. This suggests that the scale does measure a cognitive component of complex thinking and thus appears to be an acceptable substitute for use in wider applications.

Beyond these three studies, an examination of the literature appears to indicate only one natural resource management/environmental mention of integrative complexity, which is a reference to a conference abstract (Bright and Manfredo, 1992). Reference to the use of any related measure of cognitive style is also thin. These studies are mainly confined to those discussed previously. The reader will recall McClure et al.’s 1999 study detailed above. In that research, the concept of explanatory complexity was used to differentiate those with a simpler understanding of earthquakes from those with a more complex understanding. In their attributional study of Hurricane Katrina, Gomez and Wilson (2008) measured political sophistication (after Sniderman et al., 1991), which is related to cognitive sophistication, to
understand the differences in how people attribute blame. In their study, Gomez and Wilson hypothesized that people who are better able to integrate and differentiate and have higher levels of political knowledge are more capable than others to make complex attributional judgments. Gomez and Wilson found that, after taking into consideration partisanship and ideology, level of political sophistication “plays a powerful and consistent role in shaping causal attributions” (Gomez and Wilson, 2008, p. 13).

**Mediated Communication**

It has been suggested that objective knowledge should be positively associated with integrative complexity. For example, Bright and Barro (1999) hypothesized that a positive relationship between knowledge about plant and wildlife species protection and integratively complex thinking would be observed. Other investigators, such as Bobo and Licari (1989) and McClure et al. (1994) have measured cognitive complexity as a function of objective knowledge about a topic (vocabulary and earthquakes, respectively). In effect, Bobo and Licari found that knowledge (cognitive sophistication in their terminology) increased willingness to support the rights of disliked groups, while McClure et al. observed that less knowledge (explanatory complexity) resulted in less awareness of factors that mitigate earthquake. Knowledge can be directly assessed as how much a person knows about a topic, but it can also be quantified indirectly. One such indirect approach is to measure the variety of sources a person uses to obtain knowledge. A term used to discuss the types of information sources relevant to the present research is *mediated communication*. Mediated communication is “communication that involves a process by which a message, or communication, is transmitted via some form or medium” (Pavlik and McIntosh, 2004, pg. 70). Mediated communication is similar to unmediated communication and the two are easily confused. Unmediated communication occurs without the assistance of a third party or venue. In layman’s terms, unmediated communication occurs when one person speaks directly to another.
A review of the literature associated with this concept finds very little use of mediated communication in theory testing. A sub-branch entitled computer-mediated communication is fairly prevalent. However, computer-mediated communication is not relevant to this study, as it refers to human communication via computers and includes many different forms of synchronous, asynchronous or real-time interaction that humans have with each other using computers as tools to exchange text, images, audio and video.

**Contributions to the Literature**

**Connecting Attribution and Integrative Complexity**

It would seem that minimal work has been done in any field to understand the relationship between attributions of responsibility and integrative complexity. Natural resource management is relatively bereft of research into either construct on its own, let alone studies that connect the two. This is somewhat surprising, given agencies’ efforts to manage conflict, restore ecosystems, and change public attitudes and behaviors. Theory-based research into the antecedents of attributions is of value in these areas because it allows for predictions to be made regarding both how people come to judgments and how others might approach changing or modifying a person’s judgments. In addition, Bright and Tarrant’s (2002) integrative complexity findings imply that natural resource professionals should explore factors that drive attitudes, such as beliefs, values, and emotions, and that the ability to see all or several sides of an issue plays an important role in the ability of individuals to make knowledgeable judgments.

Although theorists have differed in their approaches to conceptualizing and studying attributions, they all recognize the attribution process as one of cognition: the individual analyzes an event or problem in terms of causation and assigns responsibility accordingly. Therefore, cognitive style would itself seem to be an important variable in how different people arrive at their perceptions of blame and how strongly they hold these perceptions. Despite this importance, the role that information processing may play in attributions of responsibility has
seemingly been less studied than other attributional characteristics. And, as this literature review has shown, the research that has been conducted has been infrequent, non-systematic, and has tended to be discipline or problem-specific.

Measurement Issues

One observation gleaned from a review of the integrative complexity literature is that measurement of the construct remains problematic. Simple uni-dimensional measures (e.g., Bobo and Licari’s operationalization of cognitive sophistication) seem unfulfilling, while subjective measures such as the paragraph completion test are onerous for both participants and coders. “Assessing integrative complexity requires the judgment of trained coders, who may have to make subtle inferences about the intended meaning of speakers. Coders often make difficult judgments concerning whether differentiation or integration exists in particular statements” (Baker-Brown et al., 1992, p. 3). Indeed, Baker-Brown et al. developed a 47-page manual to train coders to score IC. In addition, none of these measures appear to use specific hallmarks of integratively complex thinking as indicators. In response, this research will develop and test two new scalar measures of integrative complexity that rely on respondent self-classification. This classification is termed “naïve,” as respondents are not aware that their answers are being used to segment them on a predetermined continuum.

Groups

Ramos et al. (2002) noted that attributional processes can also occur on a group level when group members share the same causal schema with regard to various issues. These shared causal attributions most likely produce similar perceptions and attitudes in group members. Therefore, it is important to analyze the types of causal attributions that different group members make. However, few studies have sent attribution surveys to individuals belonging to pre-selected groups. Rather, such surveys have tended to be sent to individuals in a larger population
and those people then self-identify with a group listed in the survey (e.g., a political party). Thus, the survey instrument itself is the mechanism for segmenting people for analysis. This dissertation provides an opportunity to conduct a more directed examination of group attribution.

Similarly, integrative complexity research has been less studied at the group level and the literature is therefore limited. Indeed, outside of the political arena, few studies of group complexity exist. However, while the literature suggests that some variation in integrative complexity may occur at the group level, especially when those groups are based on cognitive attributes such as political ideology, there is little evidence to indicate that groups based on resource use activity would be expected to differ systematically in terms of integrative complexity level.

**Attitudes and Values**

Although research to date indicates that the relation between integrative complexity and attitudes in general may be weak (e.g., de Vries and Walker, 1987; Bright and Tarrant, 2002), a more significant relationship has been observed between integrative complexity and attitude extremity. When integrative complexity is low, individuals tend to form simple and rigid attitudes and perceptions (Suedfeld et al., 1992). Attitudes themselves are manufactured from values and value orientations. Fulton et al. (1996) and Vaske and Donnelly (1999) describe this relationship as a cognitive hierarchy of human behavior, consisting of a progression of influence from values to behavior via value orientations, attitudes and norms, and behavioral intentions. Values have also been described by some theorists as abstract attitudes (Eagly and Kulesa, 1997), though attitudes do differ from values in several important ways (Vaske and Donnelly, 1999). This research contributes to the integrative complexity-attitude literature and the relatively scant work on the integrative complexity-values relationship.
CHAPTER 3
CONCEPTUAL FRAMEWORK

The conceptual framework for this study is based on two areas of research: integrative complexity and attribution (Figure 6). This project builds on existing literature by examining the connections between the two constructs, by extending the study of integrative complexity and attitudes, values, and knowledge, and by examining the role of integrative complexity in use of mediated communication. In addition, this study expands the psychometric study of integrative complexity by developing and testing two new scalar measures.

Figure 6. Model for connecting integrative complexity to attributions, causation, attitudes and values, and mediated communication.
Objectives

The theoretical focus of this research is to understand the function that cognitive style plays in attributions of blame. However, the study also provides an opportunity to address several other conceptual questions. Therefore, this dissertation examines the:

1. relationship between integrative complexity and attributions of blame;
2. relationship between integrative complexity and knowledge of causation;
3. relationship between integrative complexity and the extremity of attitudes towards natural resource management policy alternatives;
4. relationship between integrative complexity and value orientation;
5. relationship between integrative complexity and value extremity;
6. relationship between integrative complexity and mediated communication; and the
7. relationship between group affiliation and defensive attributions.

General Hypotheses

Integrative Complexity

Attribution Style

Attribution or explanatory style has been described as a cognitive personality attribute that is reflective of the way in which individuals explain both negative and positive outcomes (Peterson and Seligman, 1984). To the extent that people exhibit tendencies and patterns in the process of attribution, it is appropriate to speak of an attribution style. The literature reviewed above suggests that those who have higher levels of integrative complexity will exhibit a different attribution style than those with lower levels of integrative complexity. The reader may recall, for example, that Gomez and Wilson (2008) found that those with a more complex understanding of politics attributed damage from Hurricane Katrina differently than those with a more simple understanding of politics. McClure et al. (1994) found a similar pattern, in that those in their sample who had a richer understanding of earthquakes attributed the damage caused by them
differently than those with less earthquake knowledge. Similarly, Kumagai et al. (2004) showed that previous experience with (and thus, most likely, knowledge of) forest fire was a determining factor in attributions of responsibility for fire damage.

As various researchers note (e.g., Suedfeld et al., 1994; Tetlock, 1998) a person’s level of integrative complexity may be an important factor in how dogmatic he is. This dogmatism may take the form of shifting blame from himself or his group. That is, the dogmatic-oriented individual, who typically accepts their own beliefs as authoritative, will be less likely to find internal fault. This process is similar to the defensive attribution (see Shaver, 1975).

Thus, persons with higher cognitive complexity tend to think more comprehensively about causation. This evidence suggests two relationships: (1) integrative complexity should be related to the number of attributable factors a respondent recognizes and (2) the proportion or ratio of blame across external and internal causal factors should be influenced by integrative complexity. On the basis of this literature, the following hypotheses are offered:

\[
\begin{align*}
\text{Ho1: } & \text{ There is no difference between level of integrative complexity and the observed pattern of blaming for a problem} \\
\text{Ha1: } & \text{ Those people that exhibit lower levels of integrative complexity will more strongly blame other relevant activities for the problem} \\
\text{Ho2: } & \text{ There is no relationship between level of integrative complexity and the number of problem causes a person records} \\
\text{Ha2: } & \text{ Those people that exhibit higher levels of integrative complexity will record more problem causes than will those who exhibit lower levels of integrative complexity}
\end{align*}
\]
**Attitude and Value Extremity**

An attitude has been defined as a predisposition to respond behaviorally or emotionally in a positive or negative way toward some object (Aijen and Fishbein, 1980; Littlejohn, 2002). In examining attitude strength, Abelson (1995) viewed the concept of attitude extremity as a theoretically useful descriptor. Several authors (e.g., Linville, 1982; Eagly and Kulesa, 1997) suggest that complex belief systems are more often associated with moderate attitudes than extreme attitudes. Tetlock et al. (1986) found that U.S. Senators with moderate voting records (a) were more likely to engage in complex, trade-off forms of reasoning and (b) more frequently acknowledged the drawbacks in the legislation they voted for and the benefits in the legislation they voted against. Bright and Manfredo (1992) found that respondents who held moderate attitudes towards natural resource management issues exhibited higher cognitive complexity than those who held more extreme attitudes.

Attitudes are manufactured from values and value orientations. Fulton et al. (1996) describes this relationship as a cognitive hierarchy of human behavior, consisting of a progression of influence from values to behavior via value orientations, attitudes and norms, and behavioral intentions. Values have also been described by some theorists as abstract attitudes (Eagly and Kulesa, 1997), though attitudes do differ from values in several important ways (Vaske and Donnelly, 1999). Nevertheless, the proximal role of values and value orientation in attitude formation suggest that integrative complexity may factor into levels above that of attitudes and norms in the Cognitive Hierarchy Model. Tetlock et al. (1984) found support for examining values according to integrative complexity. In that research conservative-value oriented politicians were observed to view competing proposals in rigid, black and white terms and tended to overlook disproportionally the potential for negative outcomes stemming from their favored policy choices. Tetlock et al. (1985) observed similar patterns when they examined U.S. Supreme Court judicial opinions. However, the integrative complexity-value findings are somewhat mixed, as Tetlock (1984) also found that more moderate British politicians exhibited
higher levels of integrative complexity than did those Parliamentarians to their ideological left. These findings, and the lack of studies examining values and integrative complexity outside of the political science literature, suggest that more research is in order. The above concepts are tested in the following hypotheses:

Ho3: There is no relationship between integrative complexity and attitude extremity

Ha3: Higher levels of integrative complexity will be positively associated with attitude moderacy

Ho4: There is no relationship between integrative complexity and value orientation

Ha4: Higher levels of integrative complexity will be positively associated with biocentric value orientation

Ho5: There is no relationship between integrative complexity and value extremity

Ha5: Higher levels of integrative complexity will be positively associated with value moderacy

**Mediated Communication**

The literature reviewed suggests that knowledge is positively correlated with integratively complex thinking such that persons with higher topic-specific knowledge also exhibit higher levels of IC (e.g., McClure et al., 1999). Mediated communication is defined by Pavlik and McIntosh (2004, p. 70) as “communication that involves a process by which a message, or communication, is transmitted via some form or medium.” In contrast, unmediated communication occurs when one person speaks directly to another. It is reasonable to suppose that an individual who reports using a wider range of mediated communication outlets about an issue will develop a deeper, richer knowledge of that issue. This concept is tested in the following hypothesis:
Defensive Attribution of Responsibility

There are actually two attributions of responsibility hypotheses in this research. The first, Ha2, is concerned with the apportionment of blame. However, because that apportionment is being examined as a function of cognitive complexity, Ha2 is included in the integrative complexity hypotheses section above. The literature reviewed suggests that people have various motivations for placing blame. These motivations relate to coping, dissonance, the desire to make ourselves feel better, a need to impress others, and to make ourselves feel safer or in control of uncontrollable events. In most cases, as the literature illustrates, these motivations are self-serving (indeed, the self-serving bias is a focus of many attribution studies) and often will result in the misplacement of blame. Attributing blame to others is especially likely in cases where a relevant other (group, individual) is available and when a person considers himself or his group to be unlike that relevant other (Shaver, 1975). On the basis of this reasoning, the final hypothesis is offered:

\[
\begin{align*}
\text{Ho6:} & \quad \text{There is no difference between level of integrative complexity and use of mediated communication} \\
\text{Ha6:} & \quad \text{Higher levels of integrative complexity will be positively associated with increased use of mediated communication}
\end{align*}
\]

\[
\begin{align*}
\text{Ho7:} & \quad \text{There is no difference between perceived personal similarity, as a function of the group a person belongs to, and the apportionment of blame for a problem} \\
\text{Ha7:} & \quad \text{In all cases, groups will assign more blame for a problem to other, dissimilar, groups than to their own group}
\end{align*}
\]
Independent Variables

Integrative complexity is the primary independent variable in this study (Ho1-6). Level of integrative complexity for this project is based on the characteristics of integratively complex thinkers: information seeking; active listening; creative/novel problem-solving; and position moderacy. Hypothesis testing is conducted via an index which was developed for this study using the four characteristics of integrative complexity mentioned above. The second independent variable is group affiliation, which is specific to Ho7 only.

Dependent Variables

The first dependent variable is attribution style. It will be operationalized in two ways: as the number of problem causes, beyond those causes directly associated with activities of the groups being studied in this research, that respondents list and as the relationship between activity-internal to activity-external attributions that respondents report. More detail on measurement is provided in Chapter 4, but the literature predicts that higher levels of integrative complexity will be positively associated with higher numbers of problem causes listed. Similarly, higher levels of integrative complexity should result in a blame pattern indicative of respondents’ distributing blame more evenly between theirs’ and others’ activities.

The second dependent variable is attitude extremity. Extreme attitudes are inferred when a respondent indicates strong disagreement or agreement with an attitude item. The most common method of measuring an attitude is the use of attitude scale (Eagly and Chaiken, 1993), of which there are several types. Likert or Likert-type scales are the most widely used scales in survey research. In this form of attitude measurement, respondents specify their level of agreement or disagreement with a statement (or Likert item).

Value orientation is the third dependent variable in this study. Research has found that it is appropriate to array values regarding natural resources along a continuum ranging from anthropocentric to biocentric (Shindler et al., 1993; Steel et al., 1994; Thompson and
An anthropocentric value orientation represents a human-centered view of the nonhuman world (Eckersley 1992) in which the instrumental value of the environment for human society is emphasized (Steel et al., 1994). In contrast, a biocentric value orientation is a nature-centered view in which the intrinsic value of ecosystems, species, and the natural physical environment is emphasized. Although society's needs remain important, those needs are evaluated in the context of the larger biosphere.

Value extremity is the fourth dependent variable. It is understood as how strongly a respondents holds either an anthropocentric or a biocentric value. For the purpose of this study, value extremity and attitude extremity are approached similarly.

The final dependent variable, mediated communication, will indicate a respondent’s use of information sources such as radio, the Internet, and newspapers to obtain information about natural resource issues. Understanding how the public or specific stakeholder groups access and receive information, and what role this information plays in cognition, can help resource managers tailor pro-social environmental messages as well as more effectively spend communication dollars.
CHAPTER 4
METHODS

**Topic and Study Area**

The problem that serves as the context for the examination of integrative complexity and attribution theory in this dissertation is the decline of the Florida Keys coral reef ecosystem. The Florida Keys are an archipelago located off the southeastern tip of the state of Florida (Figure 7). Most of the main islands are connected by U.S. Route 1, which ends in Key West.

![Figure 7. The Florida Keys archipelago.](image)

The Florida Keys’ reef tract runs parallel to the islands and is situated between four and six miles offshore in the Atlantic Ocean. It extends approximately 150 miles from Biscayne Bay to the Tortugas Banks (CORIS, 2008), making it the third largest barrier reef system in the world. It is generally reflective of coral formations found elsewhere in the Wider Caribbean Region. Most all of the reef tract is contained within the administrative boundaries of the Florida Keys National Marine Sanctuary, which surrounds nearly the entire archipelago (Figure 8).
Figure 8. The boundaries and management zones of the Florida Keys National Marine Sanctuary.  Source: FKNMS, 2011.
The ecological condition of the Florida Keys’ coral reef tract has been in relative decline for a half century or more (National Marine Protected Areas Center, 2008). This decline has continued despite regulations and increased enforcement pertaining to water quality, fishing, and terrestrial issues, as well as the establishment of state aquatic preserves (1960s and 1970s), the John Pennekamp Coral Reef State Park (1960), the Key Largo and Looe Key National Marine Sanctuaries (1975, 1981), and the creation of the Florida Keys National Marine Sanctuary (1990). The public generally appears to accept scientific findings regarding this decline (e.g., Loomis et al., 2008; Shivlani et al., 2008). Coral cover within the Sanctuary continues to diminish, and rates of disease and bleaching are increasing. For example, in the 17-year time span between 1983 and 2000, the total area of live Acropora palmata and Acropora cervicornis at Looe Key reef is estimated to have declined by 93% and 98%, respectively (Miller et al., 2002). Within the past two decades, hard coral cover has declined nearly 45% at quantitatively surveyed stations (Waddell and Clarke, 2008; FWRI, 2007) (Figure 9). Of these corals, the most affected appear to be the major reef framework-building species, such as Acropora palmata (73% loss) and Montastraea annularis (37% loss). Other threats include increasing algal invasions of seagrass and reef areas, as well as overuse, freshwater, stormwater, and wastewater management, and occasional large ship groundings (FKNMS, 2001).
Declines in fish stocks have also been recorded. A 2005 National Marine Fisheries Service (NMFS) report indicates that 11 commercially valuable species are overfished and a further 11 are subjected to overfishing (i.e., being exploited at a rate that would lead to being overfished) (Waddell and Clarke, 2008). Some populations have declined to the point of catch prohibition, such as those of Goliath and Nassau groupers and queen conch, which were closed to fishing in 1985 and remain closed (Waddell and Clarke, 2008). Spiny lobster is also a valuable commercial and recreational species in the Florida Keys. Since 1997, when a comprehensive monitoring program was established to examine the efficacy of marine reserves, abundance has declined in both reserves and exploited areas during the open season (though the decline was less precipitous in reserves). While it is not all bad news for lobsters and marine reserves – since protection, mean lobster size in protected areas has been larger than legal size, whereas in exploited areas it remained below the legal limit in most years – the continuing decline in lobster abundance indicates that surrounding fishing pressure may be impacting the ability of the small
reserves to rebuild lobsters populations (Waddell and Clarke, 2008).

**Appropriateness for the Study**

The decline of the reef ecosystem in the Florida Keys is a good topic with which to examine attributions of blame because the state of the local marine ecosystem is of social, cultural, and economic importance, and the psychology of recreation ensures that resource users have strong incentives to affix blame for the problem. In addition, human impacts from recreational and commercial uses of local reef areas are assumed to be contributive factors in coral reef degradation (Ogden, et al. 1994). These themes have played out in very public ways in the Florida Keys (Figure 10).

![Figure 10. A sign describing connections between the ecology and economy of Florida Bay.](image_url)
Furthermore, the Keys reef tract is observed as encompassing a small area relative to the number of people pursuing commercial and recreational pursuits there (e.g., Quirolo, 1994). This has featured prominently in the ongoing and oftentimes contentious process of marine resource management in the Florida Keys. Throughout this process, it has been evident that various stakeholders believed that blame for coral reef decline lay with others (Hawkins, 2001). These attributions serve as the foundation for user group conflict, stakeholder-management relationships, and individual and group acceptance of rules and regulations. Thus, a good opportunity exists to test attributional hypotheses.

**Populations of Interest**

Data for this study were collected via mail surveys of three Florida Keys’ coral reef stakeholder groups: recreational anglers, SCUBA divers, and commercial fishermen. However, the literature does not predict differences in integrative complexity between these three groups. After testing, this prediction was confirmed. Therefore, respondents from all three groups were combined into one sample in order to test the integrative complexity hypotheses in this study. Group affiliation was used only to test Ha7. However, these three groups represent economically important coral reef-dependent activities in the Florida Keys and have a contentious relationship in terms of natural resources management in South Florida (Hawkins, 2001). Indeed, Loomis et al. (2008) found distinct patterns of blaming amongst Florida Keys user groups – a finding echoed by Shivlani et al. (2008). Thus, while sampling these groups is not necessary for the integrative complexity hypotheses, having data by recreational anglers, SCUBA divers, and commercial fishermen may also be useful in publications arising from his research.

Because this project is primarily interested in theory development and testing, representative samples of anglers, commercial fishermen, and SCUBA divers were not necessary. Therefore, the samples used in the analyses are neither assumed to be representative nor are the data obtained assumed to be generalizable.
SCUBA Divers

SCUBA diving is a water-based sport that has enjoyed rapid growth over the past several decades as technology, training, and the price of equipment has made it relatively easy for more people to enter the activity. For example, it is estimated that over three million Americans went SCUBA diving at least once between 1999 and 2000. SCUBA diving is practiced in most of the world’s water bodies, from small ponds and lakes, to rivers, to the ocean. However, because of the warmth of the water and the visual allure, it is concentrated primarily in areas that contain coral reefs and reef-associated habitats (Thapa et al., 2005). The Florida Keys, which hosts North America's only barrier reef, are an example of one such area. In south Florida, SCUBA divers are a significant part of the tourism industry, and contribute substantially to the economies of the state, as well as individual counties (Leeworthy, 1996).

SCUBA divers who visit coral reefs in the Florida Keys represent an important user group with regard to attributions of coral reef decline. There are several reasons for this. First, and most relevant, is there has historically been a debate in the Florida Keys about the classification of SCUBA diving as a “non-consumptive” activity, given that several studies have shown that diving (and its associated activities, such as boat anchoring) is in fact a contributing factor to changes in species composition on reefs (e.g., Hawkins et al., 1999). This debate has been keenly watched and promoted by recreational and commercial fishermen, who often feel that SCUBA diving’s non-consumptive label has allowed it to benefit by being handed swaths of the Keys’ marine environment at the expense of other reef-dependent activities. This tension was reflected in the planning process to create the 1996 Florida Keys National Marine Sanctuary Management Plan. During this time, when no-take areas were being promoted by many, a debate erupted as to whether commercial and recreational fishing were being unfairly singled out for regulation (Hawkins, 2001). This proposal defines SCUBA divers as individuals who use tank-based or re-breather apparatus to view any coral habitats in the Florida Keys.
Commercial Fishermen

Commercial fishermen are defined here as any individuals who engage in fishing such that the majority of their income is derived from the sale of their catch regardless of gear type or target species. Because fishing is the most widespread exploitative activity on coral reefs (Jennings and Polunin, 1996), there is mounting concern about the possible effects of fishing on the Florida Keys marine environment – in particular, its reef system (Chiappone et al., 2005). In Monroe County, there are several thousand registered commercial fishing vessels that use traps or hook-and-line to fish (DiDomenico, 2001) and some have suggested that a significant amount of impact may come from lost traps and other derelict fishing gear (DiDomenico, 2001; Donohue et al., 2001). Such lost gear becomes entangled in and amongst reef structures and can destroy benthic and mobile organisms.

Commercial fishing is second only to tourism as Monroe County’s primary industry and, because there are almost no sizable bodies of freshwater, all fishing is seen as being wholly or tangentially dependant on the coral reef ecosystem. The Florida Keys area is consistently the most important area in the state in terms of commercial landings (Chiappone et al., 2002) and in 2006, the county was ranked as the fifth most valuable “port” in the nation, with a dockside value of about $54.4 million (FKCFA, 2008). However, because this figure is not inclusive of sales and profits made by wholesalers who marketed seafood products worldwide, it seems reasonable to conclude that seafood and related industries earned millions more than this. Stock Island, adjacent to Key West, is a commercial fishing hub of sorts, and alone lands approximately seven million pounds of seafood annually. There are nearly four hundred permitted commercial vessels in the Florida Keys, supporting about 1,200 families, and 80% of the state’s spiny lobster catch occurs here (FKCFA, 2008). In addition to its significant input into the economy of Monroe County, the commercial fishing fleet is also seen by many as one of the few enduring symbols of the Florida Keys’ heritage.
Recreational Anglers

Recreational anglers are defined here as a) private individuals who engage in fishing as a means of leisure, enjoyment, or maintaining social relationships and who do not profit from fishing, b) individuals with small and medium-sized vessels who are paid to bring individuals and small groups fishing (i.e., “charter fishermen”), and c) companies with larger vessels that bring larger groups fishing (i.e., “party” or “head” boats). Recreational fishing in south Florida has experienced a tremendous surge in growth over the past several decades. For example, the number of recreational fishing boats in the area increased from 37,435 in 1964 to 166,343 boats in 1998, a 344 percent increase (SFA, 2008). There are tens of thousands of recreational anglers in the Florida Keys who target hundreds of species using mostly hook-and-line and spear guns (Chiappone et al., 2002; Ault et al., 1998; Bohnsack et al., 1994; Davis, 1977).

Recreational fishing is seen by many as negatively affecting the Florida Keys’ marine environment. However, recreational fishing interests in Florida have in the past called it a fallacy to link recreational fishing to declining coral reefs. Rather, they say, “The only reason you see a decline is because the commercial industry sometimes catches those fish while using certain gear like the fish trap.” (Naples Daily News, 2002). Other observers disagree; Chiappone, et al. (2002; 2005) argue that fishing has resulted in coral reef impacts in the Florida Keys such as changes to species’ abundance, size, growth and mortality, as well as damage from lost gear including line, wire, lead sinkers, and hooks.

Identification of Survey Participants

This dissertation research is concerned with theory extension and testing. Therefore, the objective in selecting study participants is to obtain a large enough number for hypothesis testing and analysis rather than to select a representative sample. More information about this is provided in Sample Size, below.
Several approaches were used to identify potential survey respondents. For commercial fishermen, the State of Florida was contacted and provided a census of South Florida commercial fishing permit holders.

The names and addresses of SCUBA divers and recreational anglers were obtained in the following ways. First, the names and addresses of registered boat owners in Florida were obtained from the state Department of Motor Vehicles. To increase the likelihood that these individuals were anglers and/or divers, data were requested based on specific parameters (i.e., owners of boats between 20 and 30 feet with an outboard or an inboard/outboard engine). To narrow this list, the database was partitioned by Monroe County zip codes and only names that were associated with these zip codes were considered. This yielded contact information for 9,536 people. In order to have several hundred cases available for analysis by comparison group (see Sample Size below), a 20% response rate was assumed. Thus, four random mailing lists of approximately 500 people each were identified using Microsoft Excel Random Number Generator. In this procedure, all cases are assigned a random number by the computer program. Cases were then ordered from lowest to highest in the database, and the appropriate number needed for mailing was selected.

The second approach to identifying SCUBA divers and recreational fishermen was to obtain a list of state recreational fishing license-holders from the state of Florida. This list included contact information for 65,636 people. It was decided to not partition the database by Monroe County zip codes, in order to allow for the examination of differences between Florida Keys residents and other Floridians in future research. In order to have several hundred cases available for analysis by group (see Sample Size below), a 20% response rate was assumed. The response rate was based on an educated estimate, reflecting the fact that the rate was likely to be lower than usual, given the approach to implementing the survey (see Data Collection, below). Thus, four random mailing lists of approximately 500 people each were identified using Microsoft Excel Random Number Generator, and the sampling procedure noted above. A third
approach to obtaining names and contact information was to use the angling and SCUBA diving contact lists developed in Loomis et al.’s (2008) Florida Keys coral reef use study. In that study (“FRRP”), anglers, divers, and snorkelers were intercepted in the Florida Keys by research teams. Individuals were asked to participate in a coral reef use and management study and to provide a name and mailing address. Potential participants were chosen for this dissertation research from that database based on who had responded to the first mailing in that study (the assumption being that first-mailing respondents would be more willing to participate in this second, somewhat related, study). Two hundred random names from the angler and diver master lists were identified using the Microsoft Excel Random Number Generator (see discussion of procedure, above).

**Data Collection**

The questionnaires used as the data collection instruments for this project were mailed to respondents in several waves using aspects of the Dillman (1978) Total Design Method. For example, all potential study participants were sent a packet of survey materials in a hand-addressed envelope that included a questionnaire, a paid reply envelope, and a personalized, signed cover letter thanking them for their participation and ensuring their confidentiality. At this point, the procedure varied from Dillman. For logistical reasons (e.g., labor support, funding, time) and because representativeness was not a concern for this study, the traditional Dillman approach of multiple mailings to non-respondents was discarded in favor of four consecutive mailings, each about ten days apart, to unique sets of boaters and recreational fishing license-holders. Several months later, a fifth mailing was sent to an additional set of boaters and fishing license holders in order to boost sample sizes. To capture commercial fishing response, an initial mailing to the entire list of permit-holders was mailed at the same time as the first mailing to recreational anglers and boaters and a second mailing was sent to a random 30% of commercial fishing non-respondents several months later, again to boost sample sizes.
Sample Size

The hypotheses in this project examined relationships and mean differences as a function of two different comparison groups: six of the seven hypotheses tested differences according to level of integrative complexity level, while the remaining hypothesis tested differences according to group affiliation (i.e., angler, diver, or commercial fisherman). This study tests theory, and as such sample size is not determined by calculating margin of error or other considerations important to applied research. Similarly, representative sampling is not necessary. Rather, analyses depend upon having enough cases in each comparison cell (the integrative complexity levels and the group affiliation categories). Rossi et al. (1983, p.157) state that each of these comparison cells should contain at least 100 individuals, while Fowler (2008) states that in general populations only modest gains come with increasing the number of observations beyond 150-200 individuals. Therefore, the goal of this project was a sample size of 100-150 per comparison cell.

To achieve this goal, surveys were sent to all commercial fishermen on the list provided by the State of Florida of these individuals (N = 861). Several months later, 263 non-respondents were sent a second mailing. Nearly 2,100 surveys were mailed to boat registrants (it was recognized from the beginning of the study that boat registrants who responded may be either divers or anglers; thus the primary activity of any those potential respondents would not be known until they returned their surveys). Approximately 1,900 surveys were mailed to fishing license-holders. Finally, 400 surveys were sent to anglers and divers from the database of respondents to the Loomis et al. (1998) Florida Keys study (Table 2).
Table 2. Total mail survey response by database.

<table>
<thead>
<tr>
<th>Source</th>
<th>Total Available</th>
<th>Total Mailed</th>
</tr>
</thead>
<tbody>
<tr>
<td>State Boat Registry (Monroe County)</td>
<td>9,536</td>
<td>2,089</td>
</tr>
<tr>
<td>State Saltwater Angler Licenses</td>
<td>65,636</td>
<td>1,904</td>
</tr>
<tr>
<td>FRRP Divers</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>FRRP Anglers</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>State Commercial Fishing Permits</td>
<td>861</td>
<td>861</td>
</tr>
</tbody>
</table>

**Questionnaire Development**

Survey items for this study were developed over the course of a three-month period, a process that yielded two eight-page mail questionnaires. Although one survey could have been developed for all three groups, it was thought that the commercial fishing response rate might be maximized if a targeted survey instrument was sent to those individuals. However, except for Questions 1 and 2 that asked about activity, the two surveys are identical. Questions central to the hypotheses in this study were contained on all pages of the survey instrument except the last page, which was reserved as a space for respondents to volunteer additional thoughts about the survey topics.

The survey questions were developed out of the attribution, cognitive style, attitude, and Florida Keys ecology literature. Design of the instrument incorporates best practices in terms of white space, length, question wording, and flow. The questionnaire items were reviewed by fellow graduate students, an academic committee at the University of Massachusetts, and the dissertation chair for wording, relevance, and appropriateness. Based on comments, some modifications to question wording were made.
Measurement of Independent and Dependent Variables

Independent Variables

Integrative Complexity

The reader will recall that to address issues with the more qualitative paragraph completion test measurement of integrative complexity, Bright and Carroll (2006; 2010) developed and validated a scalar measure of IC (see Literature Review for details on Bright and Carroll’s approach). However, that measure retains the attribute of asking the respondent to think about and write arguments for and against the topic, which may still be cumbersome for a respondent and consequently may lower response rates and data quality. To address this issue, an integrative complexity index was developed for this dissertation research. Rather than measure differentiation and integration as separate items and then combine them to arrive at an integrative complexity score, this index relies on respondent self-classification. This measure is based on what the integrative complexity literature suggests are hallmarks of lower and higher integrative complexity.

As Tetlock et al. (1993) note, integratively complex thinkers tend to refrain from jumping to conclusions without concrete evidence and are seen as willing to change their minds when presented with contradictory evidence. They further state that these traits will be manifested in a “variety of cognitive tasks and interpersonal settings” (p. 501). For example, integratively complex people are likely to actively seek out information; listen to others’ points of view (even if those points are distasteful); attempt to solve problems in more creative ways; and hold “balanced, nuanced, and moderate positions” when involved in political disagreements (Tetlock et al., 1993). These hallmarks of complex thinkers (i.e., information seeking; active listening; creative/novel problem-solving; and position moderacy) can comprise the dimensions of an additive index in which respondents identify a level under each dimension that best describes them (Table 3). The four responses are then summed and an overall IC level calculated.
The index developed for this research is designed to segment anglers, SCUBA divers, and commercial fishermen into unique integrative complexity subgroups based on four questions (Table 3). The four responses to each item in the index are ordered from least (answer = "1") to most (answer = "4"). To determine IC, the answers for all four items are added to determine a cumulative score ranging from "4" to "16." A respondent scoring between "4" and "6" is considered to exhibit "least IC." Respondents with scores between "7" and "10" are seen as having "moderate IC." Scores between “11” and “13” are considered to be “very complex.” Finally, the “highly complex” group had cumulative index scores between “14” and “16.”
Table 3. Four-item index measurement of integrative complexity. An individual’s score could range between four-16, with four being low and 16 being high integrative complexity.

[INFORMATION SEEKING] When it comes to issues that affect or involve fishing/diving:

1. I do not keep up with current events about fishing/diving in the Florida Keys
2. I have some knowledge of current events about fishing/diving in the Florida Keys
3. Knowing about current events about fishing/diving in the Florida Keys is important to me, so I discuss these events with friends and colleagues whenever I can
4. I seek to know all I can about current events about fishing/diving in the Florida Keys and I usually spend time actively researching fishing/diving issues in order to draw the most complete conclusions

[ACTIVE LISTENING] There are differences in what people find to be acceptable uses of coral reefs. If others were to suggest using a coral reef in a way that I found disagreeable, I usually:

1. Am not particularly receptive to their point of view of their arguments. I have heard them all before and I already know what I think and believe
2. Will listen to others’ points of view, but I usually have made up my mind before-hand
3. Am almost always receptive to others’ points of view. I will reserve judgment until I understand their perspective
4. Find that it is important to me to always listen to and understand their arguments and try to incorporate their views into my thinking

[PROBLEM SOLVING] There are many examples where two or more groups have a conflict over coral reef issues. Please tell us which of the following would best describe you if you were involved in a dispute over coral reefs.

1. I am not interested in new or creative ways to solve these conflicts. What we have been doing until now is OK with me.
2. I might be willing to entertain new approaches to solving these conflicts, but I doubt anything will come of them
3. New ways to solve these conflicts wouldn’t hurt, but I would have to think about these ideas and whether they might better
4. Finding new and creative ways to solve these problems is a must because our current approaches are not working well

[MODERACY] If coral reef managers proposed new or additional regulations that restricted use at my favorite spot, my first thought would likely be:

1. I am not interested in hearing about such proposals. Coral reef managers are almost always never looking out for people who use and rely on reefs, so I would be skeptical about such regulations
2. I’m not sure there is a need to change how that place is currently managed, but I would be interested in hearing managers’ rationale
3. Some new management action might be necessary and I might be supportive if compelling information was presented to me
4. I have come to realize that we must do some things differently in managing our coral reefs. I would be open to such regulations if they are necessary, even if they would not be the best outcome for me personally
Indices developed for social science research should be investigated for reliability and validity (Babbie, 1995), especially in the initial stages of their usage. The integrative complexity index described above was examined in terms of the bivariate relationships among index items, the percent of occurrences where one index item did not sufficiently predict responses to another index item, and the alpha coefficients of the overall index and the individual index items (Babbie, 1995). In the case of the bivariate relationships, middle-range correlations (e.g., between 0.30 and 0.70) are desirable, as very low correlations indicate that one or more of the four items may not be appropriate for inclusion in the index and extremely high correlations indicate that one or more of the items are redundant and should be eliminated.

It is also expected that if the items in an additive index are measuring an underlying construct they should “hang together” in a properly developed scale. Thus, an answer of “1” on the first item should be followed by an answer of “1” on the remaining items. This “percent of occurrences” analysis provides another gauge of internal validity of an index because it measures how well one item predicts response to another item. Given that some individual variation is expected on different index questions, a good rule of thumb is to examine the percent of differences that exceed one.

Finally, Cronbach’s coefficient alpha (Cronbach, 1951) was used to examine scale reliability. Higher alpha levels imply that a set of items in an index measures a unidimensional underlying construct (Cortina, 1993). If data do not have a unidimensional structure, lower alpha levels are expected. Nunnally (1978) suggests a minimum standard for Cronbach’s alpha is 0.70 for the overall index and individual items.

**Group Affiliation**

One hypothesis in this research (Ha7) examined attribution of responsibility according to group affiliation. For recreational fishing and SCUBA diving, group affiliation was measured by asking respondents to identify which of the two was their primary activity. The remainder of the
survey was completed and analyzed per that activity. Commercial fishermen were sent a separate instrument.

Dependent Variables

Attribution Style

Attribution style has been described above as a cognitive personality variable that is reflective of the way in which individuals explain good or bad outcomes (Peterson and Seligman, 1984). This research follows the approach offered by Seligman et al. (1984), in which respondents were presented with events or scenarios and several possible causes for that outcome. Participants were then asked to choose the cause they perceived to be most likely. This format is deemed to be more appropriate to the needs of this project because it forces respondents to assign and apportion blame amongst the three user groups. It thus provides for a more controlled examination of blaming than an open-ended format (on which several attribution style measurements are indeed based). In addition, Elig and Frieze (1979) reported that open-ended attributional measures are not as reliable as fixed-format procedures.

To operationalize the Seligman et al. (1984) approach, attribution style was measured via an examination of the internal (= blame to own group) vs. external (= blame to other groups) blame pattern. This question outlined a scenario (coral reef decline in the Florida Keys) and asked respondents apportion/assign blame for that scenario (Table 4).
Table 4. The measurement of internal vs. external attributions for coral reef decline (Question 8).

Coral reefs in the Florida Keys are generally accepted as being in declining health. Research indicates that since the 1950s, live coral cover has decreased significantly, water quality is poorer, there are fewer large fish, and algae has increased. This decline has affected a number of recreational pastimes and commercial livelihoods.

Please indicate how much of a negative impact you feel each group listed below has had in terms of the decline of coral reefs in the Florida Keys.*

Commercial fishermen
   a. Trap fishermen
   b. Hook and line fishermen
   c. Trawl fishermen
SCUBA diving
   a. Private boat divers
   b. Dive shop divers
   c. Shore divers
Recreational anglers
   a. Private boat anglers
   b. Party-boat anglers
   c. Charter boat anglers

*Response categories range from 1-5, with 1="No negative impact," 2="Slight impact," 3="moderate impact," 4="Heavy impact," and 5="Very heavy negative impact"

The question allowed for an examination of how a respondent evaluated his group vs. the other two groups in terms of impact to Florida Keys coral reefs (Ha7): respondents could respond by blaming their group in all cases, other groups in all cases, or a mix of the two. It also allowed for an examination of the direction and magnitude of this external vs. internal attribution, which results in a blame pattern score. First, an own-group mean score for each of the three activities was derived from the three activity subtypes listed. Then, the “other groups” means were related to the “own group” mean. This was accomplished by subtracting own group mean from the two other groups’ means. To address the fact that two groups means were subtracted from one group’s mean, the own group’s mean was weighted by multiplying it by two prior to subtraction. The direction and magnitude of the resulting number indicated the external or internal blame pattern, as well as its severity. This variable is represented as a number between -8 and 8. Thus, if a commercial fisherman evaluated commercial fishing as having no negative impact (1) but
evaluated both recreational fishing and SCUBA diving as having very heavy negative impact (5), then his resulting blame score would be \((1 \times 2) - (5) - (5) = -8\), indicating a strong external blame pattern. Near midpoint scores indicate an equal apportionment of blame across the listed groups.

**Number of Causes**

Respondents were asked to think about and list causes for coral reef decline in the Florida Keys that were not directly associated with recreational angling, SCUBA diving, or commercial fishing. The exact wording of the questions was “In addition to recreational/commercial fishing and SCUBA diving, there may be other causes for coral reef decline. We are interested in understanding what you believe these to be.” Twelve spaces were made available for responses.

**Attitude Extremity**

Attitude extremity refers to the notion that attitudes vary in their degree of positivity/negativity and not just their direction (Bright, 1997). Abelson (1995) offers that the extremity of an attitude can be defined as a person’s intensity of feeling towards an issue. The extremity of a respondent’s attitude towards coral reef management policy alternatives was measured in a question utilizing a standard Likert-type attitude scale format (Table 5).
Table 5. The measurement of attitudes towards hypothetical coral reef management action (Question 9).

Please indicate the extent to which you disagree or agree with the following hypothetical management alternatives.*

a. More reef areas should be closed to diving  
b. Fewer recreational fishing licenses should be issued  
c. A daily quota of SCUBA divers at natural coral reef should be implemented  
d. The government should reduce the amount of fish that commercial fishermen may take from the waters of the Florida Keys  
e. The number of dive companies should be reduced in the Florida Keys  
f. Party fishing boats should not be allowed in the Florida Keys  
g. The number of charter fishing boats should be reduced in the Florida Keys  
h. The number of mooring buoys should be decreased in the Florida Keys  
i. The number of commercial fishing permits should be reduced in the Florida Keys

*Response categories range from 1-5, with 1="Strongly disagree," 2="Disagree," 3="Neutral," 4="Agree," and 5="Strongly agree"

Since extreme attitude scores are those on both ends of the scale (strongly disagree—strongly agree), data had to be recoded so that “strongly disagree” and “strongly agree” were combined into an “extreme attitude” category. Individuals in this category are seen as having “high attitude extremity”. Then, respondents who answered disagree” or “agree” were combined and labeled “medium attitude extremity.” Finally, all respondents remaining were labeled as “neutral.”

Value Orientation and Extremity

Similar to attitudes, value orientation/extremity was also assessed by using five-point scales. Two statements were used to segment respondents into value extremity levels (Table 6). To measure orientation, anthropocentric value scores were subtracted from biocentric value scores. This resulted in a value orientation continuum ranging from -4 to +4, in which negative scores indicate anthropocentric orientation and positive scores indicate biocentric orientation. For example, a person who strongly agreed with the biocentric value statement and strongly disagreed with the anthropocentric value statement would have a resulting score of 5-1 = 4 (very strongly
anthropocentric). The recoded scores are: 0 = “neutral,” 1 = “weak,” 1 = “moderately,” and 3 = “strongly” anthropocentric/biocentric orientation.

Value extremity was measured somewhat differently. Since extreme value scores are those on both ends of the original five-point Likert-type scale (strongly disagree—strongly agree), data had to be recoded so that “strongly disagree” and “strongly agree” were combined. Individuals in this category are seen as having “high value extremity.” Then, respondents who answered disagree” or “agree” were combined and labeled “medium value extremity.” Finally, all respondents remaining were labeled as “neutral.”

Table 6. The measurement of value orientation with respect to biocentric and anthropocentric coral reef management values.

<table>
<thead>
<tr>
<th>Please indicate the extent to which you disagree or agree with the following statements.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Tourism is important to the Florida Key so economic issues should be an important factor in Sanctuary decision-making.</td>
</tr>
<tr>
<td>b. Sanctuary managers should take into account only what is good for nature</td>
</tr>
</tbody>
</table>

*Response categories range from 1-5, with 1="Strongly disagree," 2="Disagree," 3="Neutral," 4="Agree," and 5="Strongly agree"

Mediated Communication

Mediated communication (MC) was measured via nine statements designed to elicit a respondent’s use of various media outlets for information on a five-point scale (Table 7).
Table 7. The measurement of respondents’ use of media sources for information about Florida Keys coral reef issues.

Please indicate the extent to which you make use of the following for current information about fishing/diving in the Florida Keys.*

a. Fishing/diving magazines 
b. Government agency publications 
c. Conservation organization publications 
d. Newspapers 
e. Fishing/diving shops 
f. Club meetings 
g. Television 
h. Radio 
i. Internet

*Response categories range from 1-5, with 1="No use," 2="Almost no use," 3="A little use," 4="Some use," and 5="A lot of use"

Data Analyses

Hypothesis Testing

There are seven distinct hypotheses being tested. Hypotheses One through Six all use integrative complexity as the independent variable: Hypothesis One examines self-other blame pattern, Hypothesis Two examines number of recorded problem causes, Hypothesis Three examines attitude extremity, Hypothesis Four examines orientation extremity, Hypothesis Five examines value extremity, and Hypothesis Six examines use of mediated communication. Hypothesis Seven tests the differences in blame according to group affiliation or membership. Throughout this study, hypotheses were tested using an alpha level of 0.10. An alpha level of 0.10 was chosen to balance the possibilities of making a Type I or a Type II error. A Type I error occurs when a true null hypothesis is rejected. In this case, significant differences would be reported when in fact no significant differences actually exist. This type of error could be very problematic in cases where study results have serious implications for human well-being, such as in medical research. A Type II error, on the other hand, occurs when a false null hypothesis is not
rejected. In this case, an area of research may be dropped prematurely. Gregorie and Driver (1979) suggest that a 0.10 level be used to reduce the possibility of Type II error. In effect, setting the alpha level at 0.10 means that there is 10% chance of concluding that a significant relationship or significant differences exists when one does not.

If the data being analyzed here are typical of many psychological data generated to test theory, they will not be normally distributed. Additionally, they will be either ordinal level or between ordinal and interval level (depending on the hypothesis). In these cases, non-parametric inferential statistics are more appropriate. While parametric statistics tend to be more powerful, since they use more information to determine significance, they can also be less accurate when assumptions about the data are violated (Thorne and Giesen, 2003). In particular, the Kruskal-Wallis H test will be computed. The Kruskal-Wallis test is the non-parametric version of the one-way Analysis of Variance (ANOVA). It examines differences between medians rather than means.

Hypotheses were tested as follows:

1) $H_{01}$ states that there is no difference in the pattern of blame according to integrative complexity. Conversely, $H_{a1}$ states that people who exhibit lower levels of integrative complexity will more strongly blame other relevant activities (recreational fishing, SCUBA diving, and commercial fishing) for the problem. For $H_{01}$, respondents were asked to evaluate on five-point scales (1=no negative impact; 5=very heavy negative impact) the negative impact of anglers, SCUBA divers, and commercial fishermen on the coral reefs of the Florida Keys. Difference testing between integrative complexity and blame pattern was accomplished by computing a Kruskal-Wallis H test, with integrative complexity as the independent variable and the blame score as the dependent variable. The Kruskal-Wallis test examines the differences in median scores according to some grouping. $H_{01}$ was rejected if a significant difference was found at the $p = .10$ level. Post-hoc analysis is necessary when using Kruskal-Wallis analysis because the test itself will indicate the presence of a significant difference but not where amongst
the comparisons it is. Because post-hoc tests for Kruskal-Wallis are not available in most statistical packages, follow-up Mann-Whitney U tests were conducted to search for pairwise differences among the three integrative complexity levels (Ho, 2011; Horn, 2011) if a significant difference was found with the Kruskal-Wallis test. For these tests, the Bonferroni approach to control for Type 1 error across tests was used, in which the a priori alpha level (.10) is divided by the number of independent variable groups (3) and the resulting number (.03) is used to interpret the reported p values (Ho, 2011). Ha1 was accepted if the Mann-Whitney U test p values were less than .03 and in the direction predicted.

2) Ho2 states that there is no relationship between the number of problem causes and integrative complexity. Conversely, Ha2 states that those who exhibit higher levels of integrative complexity will record more problem causes. To test Ho2, respondents were asked to list causes for coral reef decline other than those directly associated with recreational fishing, SCUBA diving, and commercial fishing. Twelve spaces were provided for this. These data were then manipulated as follows: equal groups were created based on the maxima of the response distribution (0, 8). This resulted in three groups: those who recorded 0, 1, or 2 causes were placed in group “1,” those who recorded 3, 4, or 5 causes were placed in group “2,” and those who recorded 6, 7, or 8 causes were placed in group “3.” A Spearman rho correlation coefficient was then calculated for the relationship between respondents’ integrative complexity level and recorded causes for coral reef decline in the Florida Keys. Ho2 was rejected if a non-zero correlation coefficient was observed. Ha2 was accepted if the correlation was positive and significant.

3) Ho3 states that there is no difference in attitude extremity according to integrative complexity. Conversely, Ha3 states that people with higher levels of integrative complexity will tend to exhibit attitude moderacy. To test Ho3, respondents were asked to evaluate on five-point scales (1=strongly disagree; 5=strongly agree) nine attitudinal questions regarding hypothetical coral reef management alternatives. Attitude scores for each item were then recoded into three
categories: “strongly disagree” and “strongly agree” = high attitude extremity, “disagree” and “agree” = medium attitude extremity, and “neutral.” Median testing was accomplished by conducting a series of Kruskal-Wallis tests with integrative complexity level as the independent variable and attitude extremity score as the dependent variable. Post hoc analyses, rejection of the null hypothesis, and acceptance of the alternate hypothesis were accomplished in the same manner described in Ha1.

4) Ho4 states that there is no difference in value orientation according to integrative complexity. Conversely, Ha4 states that people with higher levels of integrative complexity will tend to exhibit biocentric value orientation. To test Ho4, respondents were asked two value orientation questions. The first asked whether respondents felt that the importance of tourism to the Florida Keys economy suggests that economic issues be an important factor in Florida Keys National Marine Sanctuary decision-making. The second question asked whether respondents felt that Sanctuary managers should take into account only what is good for nature. Both questions were evaluated on five-point scales (1=strongly disagree; 5=strongly agree). Data were then manipulated as follows: the respondent’s score for the biocentric questions was subtracted from his score for the anthropocentric question. This resulted in a score continuum from -4 to +4, where -4 = “strongly biocentric,” 0 = “neutral,” and +4 = “strongly anthropocentric. Median testing was accomplished by computing Kruskal-Wallis tests, with integrative complexity as the independent variable and the value orientation score as the dependent variable. Post hoc analyses, rejection of the null hypothesis, and acceptance of the alternate hypothesis were accomplished in the same manner described in Ha1.

5) Ho5 states that there is no difference in value extremity according to integrative complexity. Conversely, Ha5 states that people with higher levels of integrative complexity will tend to exhibit value moderacy. To test Ho5, respondents were asked two value orientation questions. The first asked whether respondents felt that the importance of tourism to the Florida Keys economy suggests that economic issues be an important factor in Florida Keys National
Marine Sanctuary decision-making. The second question asked whether respondents felt that Sanctuary managers should take into account only what is good for nature. Both questions were evaluated on five-point scales (1=strongly disagree; 5=strongly agree). Data were then recoded into three categories: “strongly disagree” and “strongly agree” = high value extremity, “disagree” and “agree” = medium value extremity, and “neutral.” Median testing was accomplished by computing a Kruskal-Wallis test, with integrative complexity as the independent variable and the value extremity score as the dependent variable. Post hoc analyses, rejection of the null hypothesis, and acceptance of the alternate hypothesis were accomplished in the same manner described in Ha1.

6) Ho6 states there is no difference in use of mediated communication according to integrative complexity. Conversely, Ha6 states that people with higher levels of integrative complexity will tend to use mediated communication more. Median testing was accomplished by computing a series of Kruskal-Wallis tests, with integrative complexity as the independent variable and mediated communication scores as the dependent variables. Post hoc analyses, rejection of the null hypothesis, and acceptance of the alternate hypothesis were accomplished in the same manner described in Ha1.

6) Ho7 states that there is no difference in assignment of blame amongst the three groups (anglers, divers, and commercial fishermen). Conversely, Ha7 states that people will assign more blame for the present condition of the Florida Keys coral reef ecosystem to both of the two other user groups than to their own. To test Ho7, respondents were asked to evaluate on five-point scales (1=no negative impact; 5=very heavy negative impact) the impact of anglers, SCUBA divers, and commercial fishermen on the coral reefs of the Florida Keys. Data were then manipulated to create the apportionment of blame scale described above in Measurement of Dependent Variables. Median testing was accomplished by computing a Kruskal-Wallis test, with group affiliation as the independent variable and apportionment of blame score as the
dependent variables. Post hoc analyses, rejection of the null hypothesis, and acceptance of the alternate hypothesis were accomplished in the same manner described in Ha1.
Surveys Response and Respondent Classification

After survey data were entered, there were a total of 570 recreational angler cases and 148 SCUBA diving cases available for analysis. However, overall response rates for recreational fishing and SCUBA cannot be calculated. This is because the primary activity of respondents who were surveyed using the state boat registration and fishing license databases was not known for certain at the time of survey implementation (Tables 8 and 9). While response rates are not relevant if representativeness in not an issue, it is nonetheless appropriate to report out sampling the results.

Commercial fishermen received a separate survey instrument. For commercial fishing, 861 surveys were sent initially, and a random 30% of non-respondents received a second mailing several months later. After survey data were entered, there were a total of 179 commercial fishing cases available for analysis, representing a response rate of 20.9%.

Table 8. Total mail survey response by database.

<table>
<thead>
<tr>
<th>Source</th>
<th>Total Mailed</th>
<th>Non-Deliverable</th>
<th>Returned</th>
</tr>
</thead>
<tbody>
<tr>
<td>State Boat Registry</td>
<td>2087</td>
<td>87</td>
<td>357</td>
</tr>
<tr>
<td>State Saltwater Angler Licenses</td>
<td>1904</td>
<td>163</td>
<td>245</td>
</tr>
<tr>
<td>FRRP Divers</td>
<td>200</td>
<td>12</td>
<td>54</td>
</tr>
<tr>
<td>FRRP Anglers</td>
<td>200</td>
<td>22</td>
<td>62</td>
</tr>
<tr>
<td>Totals</td>
<td>4391</td>
<td>284</td>
<td>718</td>
</tr>
<tr>
<td>State Commercial Fishing Permits</td>
<td>861</td>
<td>5</td>
<td>179</td>
</tr>
</tbody>
</table>
Table 9. Distribution of angler and diver response by database.

<table>
<thead>
<tr>
<th>Source</th>
<th>Total Response</th>
<th>Anglers</th>
<th>Divers</th>
</tr>
</thead>
<tbody>
<tr>
<td>State Boat Registry</td>
<td>357</td>
<td>286</td>
<td>75</td>
</tr>
<tr>
<td>State Saltwater Angler Licenses</td>
<td>245</td>
<td>222</td>
<td>19</td>
</tr>
<tr>
<td>FRRP Divers</td>
<td>54</td>
<td>0</td>
<td>54</td>
</tr>
<tr>
<td>FRRP Anglers</td>
<td>62</td>
<td>62</td>
<td>0</td>
</tr>
<tr>
<td>Totals</td>
<td>718</td>
<td>570</td>
<td>148</td>
</tr>
</tbody>
</table>

**Recreational Angler Characteristics**

Due to the sampling scheme, a majority of the recreational anglers in the sample were residents of the Florida Keys (N=427, 85.5%). Length of residence ranged from one year to 73 years, with an average residency of 17.5 years (median=15). Seventy-nine (14.5%) were visitors to the Florida Keys and did not live there. Respondents varied in avidity; days fishing per year ranged from one to as many as 340 days, with an average of 47 days per year (median=30). There are more men (N=474, 86%) in the sample than women (N=79, 14%).

**SCUBA Diver Characteristics**

A majority of the divers in the sample were residents of the Florida Keys (N=89, 61%). Length of residence ranged from one year to 64 years, with an average residency of 16.45 years (median=15). Fifty-seven (39%) were visitors to the Florida Keys and did not live there. Respondents varied in avidity; days SCUBA diving per year ranged from two to as many as 300 days, with an average of 36 days per year (median=20). There are more men (N=105, 71%) in the sample than women (N=42, 29%).

**Commercial Fishermen Characteristics**

Since Florida Keys commercial fishermen were targeted for inclusion in this study, a majority of the recreational anglers in the sample were residents of the Florida Keys (N=146, 84.0%). Length of residence ranged from one year to 71 years, with an average residency of 17.5
years (median=15). Twenty-eight (16.0%) lived outside of the Florida Keys. The number of
days per year spent commercial fishing ranged from two to 365 days, with an average of 123 days
per year (median=100). There are more men (N=157, 90%) in the sample than women (N=15,
9%).

**Integrative Complexity Index**

This section reports the results of the integrative complexity index in terms of
classification according to group, across the entire sample, correlations between the groups, and
the results of index item analysis. The reader will recall from the Methods section that the
integrative complexity index contained four items: information seeking; active listening;
creative/novel problem-solving; and position moderacy. Four answers were possible for each
item and ranged from least integratively complex (answer = “1”) to most integratively complex
(answer = “4”). Assigning an index score to an individual is then a matter of adding together his
responses to the four items to determine his cumulative index score. A respondent who answered
all four questions in the index could score between “4” at the least complex end and “16” at the
most complex end. Very few respondents had low cumulative scores, with only six respondents
across all three groups having the lowest possible score of “4.” Instead, respondents clustered
towards the higher end of the complexity continuum (Tables 10-12).

A similar pattern emerged across anglers, divers, and commercial fishermen: very few
respondents circled the “1” option. Within each group, the greatest percentage of respondents
circled option “3,” followed by option “4” and then option “2” for each of the index items (Tables
10-12). This is consistent with the literature; anglers, divers, and commercial fishermen are not
likely to systematically differ in any substantial way in terms of their group integrative
complexity.
Table 10. Recreational angler distribution according to cumulative index score.

<table>
<thead>
<tr>
<th>Integrative Complexity Score</th>
<th>N</th>
<th>Cum. N</th>
<th>%</th>
<th>Cum.%</th>
</tr>
</thead>
<tbody>
<tr>
<td>(4).............................</td>
<td>2</td>
<td>2</td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td>(5).............................</td>
<td>2</td>
<td>4</td>
<td>0.4</td>
<td>0.8</td>
</tr>
<tr>
<td>(6).............................</td>
<td>4</td>
<td>8</td>
<td>0.7</td>
<td>1.5</td>
</tr>
<tr>
<td>(7).............................</td>
<td>16</td>
<td>24</td>
<td>3.0</td>
<td>4.5</td>
</tr>
<tr>
<td>(8).............................</td>
<td>11</td>
<td>35</td>
<td>2.0</td>
<td>6.5</td>
</tr>
<tr>
<td>(9).............................</td>
<td>41</td>
<td>76</td>
<td>7.6</td>
<td>14.1</td>
</tr>
<tr>
<td>(10)...........................</td>
<td>66</td>
<td>142</td>
<td>13.0</td>
<td>27.1</td>
</tr>
<tr>
<td>(11)...........................</td>
<td>85</td>
<td>227</td>
<td>16.0</td>
<td>43.1</td>
</tr>
<tr>
<td>(12)...........................</td>
<td>118</td>
<td>345</td>
<td>22.0</td>
<td>65.1</td>
</tr>
<tr>
<td>(13)...........................</td>
<td>115</td>
<td>460</td>
<td>21.0</td>
<td>86.1</td>
</tr>
<tr>
<td>(14)...........................</td>
<td>41</td>
<td>501</td>
<td>7.6</td>
<td>93.7</td>
</tr>
<tr>
<td>(15)...........................</td>
<td>19</td>
<td>520</td>
<td>3.5</td>
<td>97.2</td>
</tr>
<tr>
<td>(16)...........................</td>
<td>8</td>
<td>528</td>
<td>2.8</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 11. SCUBA diver distribution according to cumulative index score.

<table>
<thead>
<tr>
<th>Integrative Complexity Score</th>
<th>N</th>
<th>Cum. N</th>
<th>%</th>
<th>Cum.%</th>
</tr>
</thead>
<tbody>
<tr>
<td>(4).............................</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>(5).............................</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>(6).............................</td>
<td>1</td>
<td>1</td>
<td>0.7</td>
<td>0.7</td>
</tr>
<tr>
<td>(7).............................</td>
<td>1</td>
<td>2</td>
<td>0.7</td>
<td>1.4</td>
</tr>
<tr>
<td>(8).............................</td>
<td>3</td>
<td>5</td>
<td>2.1</td>
<td>3.5</td>
</tr>
<tr>
<td>(9).............................</td>
<td>9</td>
<td>14</td>
<td>6.3</td>
<td>9.8</td>
</tr>
<tr>
<td>(10).........................</td>
<td>15</td>
<td>29</td>
<td>10.0</td>
<td>19.8</td>
</tr>
<tr>
<td>(11).........................</td>
<td>25</td>
<td>54</td>
<td>19.0</td>
<td>38.8</td>
</tr>
<tr>
<td>(12).........................</td>
<td>29</td>
<td>83</td>
<td>21.0</td>
<td>59.8</td>
</tr>
<tr>
<td>(13).........................</td>
<td>26</td>
<td>109</td>
<td>18.0</td>
<td>77.8</td>
</tr>
<tr>
<td>(14).........................</td>
<td>18</td>
<td>127</td>
<td>14.4</td>
<td>92.2</td>
</tr>
<tr>
<td>(15).........................</td>
<td>6</td>
<td>133</td>
<td>4.2</td>
<td>96.4</td>
</tr>
<tr>
<td>(16).........................</td>
<td>5</td>
<td>138</td>
<td>3.6</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Table 12. Commercial fishermen distribution according to cumulative index score.

<table>
<thead>
<tr>
<th>Integrative Complexity Score</th>
<th>N</th>
<th>Cum. N</th>
<th>%</th>
<th>Cum.%</th>
</tr>
</thead>
<tbody>
<tr>
<td>(4)----------------------------</td>
<td>4</td>
<td>4</td>
<td>2.4</td>
<td>2.4</td>
</tr>
<tr>
<td>(5)----------------------------</td>
<td>1</td>
<td>5</td>
<td>0.6</td>
<td>3.0</td>
</tr>
<tr>
<td>(6)----------------------------</td>
<td>3</td>
<td>8</td>
<td>1.9</td>
<td>4.9</td>
</tr>
<tr>
<td>(7)----------------------------</td>
<td>3</td>
<td>11</td>
<td>1.9</td>
<td>6.8</td>
</tr>
<tr>
<td>(8)----------------------------</td>
<td>5</td>
<td>16</td>
<td>3.1</td>
<td>9.9</td>
</tr>
<tr>
<td>(9)----------------------------</td>
<td>12</td>
<td>28</td>
<td>7.4</td>
<td>17.3</td>
</tr>
<tr>
<td>(10)---------------------------</td>
<td>19</td>
<td>47</td>
<td>11.7</td>
<td>29.0</td>
</tr>
<tr>
<td>(11)---------------------------</td>
<td>34</td>
<td>81</td>
<td>21.0</td>
<td>50.0</td>
</tr>
<tr>
<td>(12)---------------------------</td>
<td>34</td>
<td>115</td>
<td>21.0</td>
<td>71.0</td>
</tr>
<tr>
<td>(13)---------------------------</td>
<td>26</td>
<td>141</td>
<td>16.0</td>
<td>87.0</td>
</tr>
<tr>
<td>(14)---------------------------</td>
<td>11</td>
<td>152</td>
<td>6.8</td>
<td>93.8</td>
</tr>
<tr>
<td>(15)---------------------------</td>
<td>7</td>
<td>159</td>
<td>4.3</td>
<td>98.1</td>
</tr>
<tr>
<td>(16)---------------------------</td>
<td>3</td>
<td>162</td>
<td>1.9</td>
<td>100.0</td>
</tr>
</tbody>
</table>

To refresh the reader’s memory, in the final stage of creating integrative complexity categories, cumulative scores were assigned to one of four index levels. An index level of “1” was assigned to cumulative scores ranging between “4” and “6”; this was the “least complex” group. The “moderately complex” group had cumulative index scores between “7” and “10” and was assigned an index score of “2.” The “very complex” group had cumulative index scores between “11” and “13” and was assigned an index score of “3.” Finally, the “highly complex” group had cumulative index scores between “14” and “16” and was assigned an index score of “4.” Using this approach, the vast majority of respondents fell into the moderate, very, and high complexity levels (Table 13).

Table 13. Distribution according to IC level – all groups.

<table>
<thead>
<tr>
<th>IC Level</th>
<th>Anglers</th>
<th></th>
<th>Divers</th>
<th></th>
<th>Comm. Fishermen</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Least</td>
<td>8</td>
<td>1.5</td>
<td>1</td>
<td>0.7</td>
<td>8</td>
<td>4.8</td>
</tr>
<tr>
<td>Moderately</td>
<td>139</td>
<td>26.0</td>
<td>30</td>
<td>22.0</td>
<td>39</td>
<td>24.2</td>
</tr>
<tr>
<td>Very</td>
<td>325</td>
<td>59.5</td>
<td>84</td>
<td>58.0</td>
<td>97</td>
<td>58.0</td>
</tr>
<tr>
<td>Highly</td>
<td>70</td>
<td>13.0</td>
<td>29</td>
<td>20.3</td>
<td>22</td>
<td>13.0</td>
</tr>
<tr>
<td>Total</td>
<td>540</td>
<td>100.0</td>
<td>148</td>
<td>100.0</td>
<td>177</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Integrative complexity scores and levels are reported in Table 14 by group. However, because all respondents are to be combined for the purpose of testing the integrative complexity hypotheses, it is important to determine whether doing so is supported statistically. Two tests were conducted to validate the observed similarity between the groups in terms of integrative complexity level distribution – a Pearson correlation was computed comparing the distribution of the percentage of response across all three groups and a Kruskal–Wallis test was computed comparing integrative complexity levels across the three groups. No significant median differences were found between the three groups (Table 14), while strong positive correlations were found (Table 15).

Table 14. Kruskal-Wallis tests for median rank differences in value orientation according to index integrative complexity level.

<table>
<thead>
<tr>
<th>Item</th>
<th>Group Affiliation</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrative Complexity</td>
<td>Angler</td>
<td>415.35*</td>
<td>Diver</td>
<td>442.11</td>
<td>Comm. Fish.</td>
</tr>
</tbody>
</table>

*Median scores underlined by same line are not significantly different.

Table 15. Correlation analysis between the index levels (in percent of response) of anglers, divers, and commercial fishermen.

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Correlation Coefficient</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anglers and Divers</td>
<td>.98</td>
<td>.000*</td>
</tr>
<tr>
<td>Anglers and Commercial Fishermen</td>
<td>.99</td>
<td>.000*</td>
</tr>
<tr>
<td>Divers and Commercial Fishermen</td>
<td>.98</td>
<td>.000*</td>
</tr>
</tbody>
</table>

*Correlation is significant at the .01 level.

The results of these tests indicate that it is appropriate to combine all respondents for the purpose of testing the integrative complexity hypotheses. Had the three groups exhibited significantly different integrative complexity score patterns, then combining all responses for analysis may have been inappropriate. The overall distribution of integrative complexity across
the sample was generally reflective of the integrative complexity patterns observed for each of the groups (Table 16, Figure 11).

Table 16. Distribution of all respondents according to IC level.

<table>
<thead>
<tr>
<th>Integrative Complexity Level</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Least</td>
<td>17</td>
<td>1.9</td>
</tr>
<tr>
<td>Moderately</td>
<td>208</td>
<td>24.4</td>
</tr>
<tr>
<td>Very</td>
<td>506</td>
<td>59.4</td>
</tr>
<tr>
<td>Highly</td>
<td>121</td>
<td>14.3</td>
</tr>
<tr>
<td>Total</td>
<td>852</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Figure 11. Distribution of all respondents according to IC level.

To understand the validity and reliability of the index, bivariate relationships among index items were examined, the percent of occurrences where one index item did not sufficiently predict responses to another index item was calculated, and the alpha coefficients of the overall index and the individual index items were determined. It was recognized that very few respondents fell into the least complex category, and that this category could not be included in

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the hypotheses testing due to small sample size. Therefore, these cases were combined with those in the moderate complexity level for purposes of later analysis. The following procedures examine the modified index that contained three integrative complexity levels: moderate, very, and high complexity.

First, bivariate relationships among the items in the index (i.e., information seeking; active listening; creative/novel problem-solving; and position moderacy) were examined across all respondents to determine the degree to which the items were related (Babbie, 1995). Correlation coefficients for most of the six pair-wise comparisons were low to moderate across respondents. Coefficients ranged from .02 to .48 (Table 17). When examined by group, correlation coefficients for most of the six pair-wise comparisons were also low to moderate: .06 to .47 (anglers), .01 to .41 (SCUBA divers), and .14 to .48 (commercial fishermen) (Table 18).

In general, these values are low; suggesting in some cases that much of the variation was not being accounted for.

Table 17. Correlation coefficients for index item pairs – all respondents combined.

<table>
<thead>
<tr>
<th>Index and Items</th>
<th>All Respondents Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Seeking and Active Listening</td>
<td>.14</td>
</tr>
<tr>
<td>Active Listening and Problem Solving</td>
<td>.17</td>
</tr>
<tr>
<td>Problem Solving and Information Seeking</td>
<td>.02</td>
</tr>
<tr>
<td>Position Moderacy and Active Listening</td>
<td>.23</td>
</tr>
<tr>
<td>Position Moderacy and Problem Solving</td>
<td>.19</td>
</tr>
<tr>
<td>Position Moderacy and Information Seeking</td>
<td>.48</td>
</tr>
</tbody>
</table>

Table 18. Correlation coefficients for index item pairs – by group.

<table>
<thead>
<tr>
<th>Index Item Pair</th>
<th>Anglers</th>
<th>Divers</th>
<th>Commercial Fishermen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Seeking and Active Listening</td>
<td>.13</td>
<td>.13</td>
<td>.20</td>
</tr>
<tr>
<td>Active Listening and Problem Solving</td>
<td>.22</td>
<td>.25</td>
<td>.26</td>
</tr>
<tr>
<td>Problem Solving and Information Seeking</td>
<td>.17</td>
<td>.18</td>
<td>.36</td>
</tr>
<tr>
<td>Position Moderacy and Active Listening</td>
<td>.18</td>
<td>.19</td>
<td>.28</td>
</tr>
<tr>
<td>Position Moderacy and Problem Solving</td>
<td>.47</td>
<td>.41</td>
<td>.48</td>
</tr>
<tr>
<td>Position Moderacy and Information Seeking</td>
<td>.06</td>
<td>.01</td>
<td>.14</td>
</tr>
</tbody>
</table>
In addition to the correlation analysis, the percent of occurrences when two variables
differed from each other by more than one was examined. This analysis is one gauge of the
internal validity of an index, because it is a measure of how well one item predicts response to
another item. While it would be ideal to observe very low percentages differing by more than
one, the reader will note that for combined responses, the percentage of responses that did differ
by more than one was less than 25% (Table 19). When groups were examined, the prediction rate
was not as solid: one item pair approached 30% (Table 20).

**Table 19. Percentage of responses differing by more than one – all respondents.**

<table>
<thead>
<tr>
<th>Index and Items</th>
<th>All Respondents Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Seeking and Active Listening</td>
<td>11%</td>
</tr>
<tr>
<td>Active Listening and Problem Solving</td>
<td>11%</td>
</tr>
<tr>
<td>Problem Solving and Information Seeking</td>
<td>16%</td>
</tr>
<tr>
<td>Position Moderacy and Active Listening</td>
<td>16%</td>
</tr>
<tr>
<td>Position Moderacy and Problem Solving</td>
<td>12%</td>
</tr>
<tr>
<td>Position Moderacy and Information Seeking</td>
<td>24%</td>
</tr>
</tbody>
</table>

**Table 20. Percentage of responses differing by more than one – by group.**

<table>
<thead>
<tr>
<th>Index Item Pair</th>
<th>Anglers</th>
<th>Divers</th>
<th>Commercial Fishermen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Seeking and Active Listening</td>
<td>11.3%</td>
<td>9.0%</td>
<td>12.1%</td>
</tr>
<tr>
<td>Active Listening and Problem Solving</td>
<td>10.6%</td>
<td>10.4%</td>
<td>9.0%</td>
</tr>
<tr>
<td>Problem Solving and Information Seeking</td>
<td>17.0%</td>
<td>18.1%</td>
<td>6.6%</td>
</tr>
<tr>
<td>Position Moderacy and Active Listening</td>
<td>14.1%</td>
<td>14.6%</td>
<td>19.9%</td>
</tr>
<tr>
<td>Position Moderacy and Problem Solving</td>
<td>10.0%</td>
<td>6.9%</td>
<td>20.5%</td>
</tr>
<tr>
<td>Position Moderacy and Information Seeking</td>
<td>20.9%</td>
<td>22.8%</td>
<td>29.5%</td>
</tr>
</tbody>
</table>

Finally, index reliability/consistency was tested using Cronbach’s coefficient alpha
(Cronbach, 1951). Also reported are values for alpha when a particular item was deleted to
determine the sensitivity of alpha to the deletion of individual items. For both combined
responses and responses by group, alpha values are low to moderate (Tables 21 and 22).
Table 21. Coefficient alpha values for indices and individual items – all respondents.

<table>
<thead>
<tr>
<th>Index and Items</th>
<th>All Respondents Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Index ..................................</td>
<td>.47</td>
</tr>
<tr>
<td>Information Seeking Removed ..............</td>
<td>.53</td>
</tr>
<tr>
<td>Active Listening Removed ..................</td>
<td>.40</td>
</tr>
<tr>
<td>Problem Solving Removed ...................</td>
<td>.24</td>
</tr>
<tr>
<td>Position Moderacy ...........................</td>
<td>.40</td>
</tr>
</tbody>
</table>

Table 22. Coefficient alpha values for indices and individual items – all groups.

<table>
<thead>
<tr>
<th>Index and Items</th>
<th>Anglers</th>
<th>Divers</th>
<th>Commercial Fishermen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Index ................................</td>
<td>.50</td>
<td>.47</td>
<td>.62</td>
</tr>
<tr>
<td>Information Seeking Removed .............</td>
<td>.56</td>
<td>.53</td>
<td>.60</td>
</tr>
<tr>
<td>Active Listening Removed ................</td>
<td>.47</td>
<td>.40</td>
<td>.58</td>
</tr>
<tr>
<td>Problem Solving Removed ..................</td>
<td>.28</td>
<td>.24</td>
<td>.45</td>
</tr>
<tr>
<td>Position Moderacy ..........................</td>
<td>.37</td>
<td>.40</td>
<td>.54</td>
</tr>
</tbody>
</table>

The results of the reliability and internal validity measures suggest that the index should be improved if it is to be used in future applications. Such improvements may include modifying item wording and/or selecting different integrative complexity hallmarks for inclusion. For example, Information Seeking appears to be problematic. However, item analysis is one approach to understanding the functionality of an index or scale. In addition to standing on their own, these findings must also be viewed in light of the hypotheses test results.

**Hypothesis Testing**

Six of the seven hypotheses in this study were designed with integrative complexity as the independent variable. The seventh hypothesis used group affiliation as the independent variable. These two independent variable groups must be considered when examining available cases for analysis.

The integrative complexity comparisons (Ho1, Ho2, Ho3, Ho4, Ho5, and Ho6) are considered first. The least complex category was combined with moderately complex
respondents, since only a small proportion (1.9%) fell into the lowest IC level. Therefore, tests are based on three complexity levels: moderately, very, and highly. After categories were combined and the data were sorted, there were 225 moderately complex, 506 very complex, and 121 highly complex cases (Table 23). With respect to hypothesis testing by group affiliation (Ho7), there were 570 recreational angler cases, 148 SCUBA diver cases, and 177 commercial fishermen cases after data entry and sorting (Table 24).

Table 23. Integrative complexity distribution of among and across groups (index).

<table>
<thead>
<tr>
<th>Group</th>
<th>Moderately</th>
<th>Very</th>
<th>Highly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recreational Anglers</td>
<td>147</td>
<td>325</td>
<td>70</td>
</tr>
<tr>
<td>SCUBA Divers</td>
<td>31</td>
<td>84</td>
<td>29</td>
</tr>
<tr>
<td>Commercial Fishermen</td>
<td>47</td>
<td>97</td>
<td>22</td>
</tr>
<tr>
<td>Totals</td>
<td>225</td>
<td>506</td>
<td>121</td>
</tr>
</tbody>
</table>

Table 24. Distribution of respondents according to group affiliation.

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recreational Anglers</td>
<td>570</td>
</tr>
<tr>
<td>SCUBA Divers</td>
<td>148</td>
</tr>
<tr>
<td>Commercial Fishermen</td>
<td>177</td>
</tr>
</tbody>
</table>

Integrative Complexity Comparisons

Attributional Style: Attribution of Responsibility Pattern (Ha1)

It was predicted that people who exhibit lower levels of integrative complexity will more strongly blame other relevant activities for coral reef decline in the Florida Keys. A Kruskal-Wallis test was computed to test for differences in blame pattern score according to integrative complexity level. No significant differences were found among the three groups and thus Ho1 cannot be rejected (Table 25).
Table 25. Kruskal-Wallis test for mean differences in blame pattern according to integrative complexity level.

<table>
<thead>
<tr>
<th>Item</th>
<th>M</th>
<th>V</th>
<th>H</th>
<th>H</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blame Pattern</td>
<td>435.59*</td>
<td>448.62</td>
<td>432.57</td>
<td>.666</td>
<td>.717</td>
</tr>
</tbody>
</table>

* Medians underscored by same line are not significantly different. Median scores are based on a -8 to +8 scale. Manipulation of the data to create the blame pattern scale is described in “Measurement of Dependent Variables” above. Test result statistics reflect the sums of the median ranks.

Attributional Style: Number of Causes (Ha2)

It was predicted that that those who exhibit higher levels of integrative complexity would record more causes for coral reef decline in the Florida Keys. A Spearman rho correlation coefficient was calculated for the relationship between respondents’ integrative complexity level and recorded causes for coral reef decline in the Florida Keys. A correlation was found and Ho2 is rejected. This correlation was statistically significant and in the predicted direction, and Ha2 is accepted (Table 26).

Table 26. Spearman correlation for relationship between integrative complexity level and recorded causes.

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Correlation Coefficient</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrative complexity and recorded causes</td>
<td>.20</td>
<td>.000*</td>
</tr>
</tbody>
</table>

Recorded causes were transformed from count to ordinal data for the purpose of this analysis. Counts between 0 and 2 were coded “1,” counts between 3 and 5 were coded “2,” and counts between 6 and 8 were coded “3.” *Correlation is significant at the .01 level.

Attitude Extremity (Ha3)

It was predicted that those who indicate higher levels of integrative complexity would exhibit attitude moderacy. Prior to testing Ha3, the mean distribution of attitude scores and overall mean extremity for each item was calculated (Table 27). In addition, the distribution of
neutral, medium, and high attitude extremity is presented (Table 28). As discussed in the Methods section, these scores were derived by combining “strongly disagree” and “strongly agree” responses and “disagree” and “agree” responses.

Table 27. Distribution of extreme and moderate responses towards attitude items.

<table>
<thead>
<tr>
<th>Items</th>
<th>Response Category</th>
<th></th>
<th></th>
<th></th>
<th>% Extreme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close more reefs to diving................</td>
<td></td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Issue fewer fishing licenses..............</td>
<td></td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily quota of divers.....................</td>
<td></td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduce commercial catch....................</td>
<td></td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fewer dive companies......................</td>
<td></td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No party fishing boats.....................</td>
<td></td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fewer charter fishing boats..............</td>
<td></td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduce mooring buoys......................</td>
<td></td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduce comm. fish. permits................</td>
<td></td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Response categories: 1 = “strongly disagree,” 2 = “disagree,” 3 = “neutral,” 4 = “agree,” and 5 = “strongly agree.” **Percent extreme” is derived by summing the scores for “strongly disagree” and “strongly agree” and dividing this number by the sum of all scores for that item.

Table 28. Distribution of neutral, medium, and high attitude extremity scores.

<table>
<thead>
<tr>
<th>Items</th>
<th>Neutral</th>
<th>Medium Extremity</th>
<th>High Extremity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close more reefs to diving................</td>
<td>223</td>
<td>420</td>
<td>291</td>
</tr>
<tr>
<td>Issue fewer fishing licenses..............</td>
<td>145</td>
<td>401</td>
<td>382</td>
</tr>
<tr>
<td>Daily quota of divers.....................</td>
<td>228</td>
<td>431</td>
<td>274</td>
</tr>
<tr>
<td>Reduce commercial catch....................</td>
<td>162</td>
<td>411</td>
<td>359</td>
</tr>
<tr>
<td>Fewer dive companies......................</td>
<td>315</td>
<td>394</td>
<td>225</td>
</tr>
<tr>
<td>No party fishing boats.....................</td>
<td>227</td>
<td>426</td>
<td>285</td>
</tr>
<tr>
<td>Fewer charter fishing boats..............</td>
<td>236</td>
<td>413</td>
<td>285</td>
</tr>
<tr>
<td>Reduce mooring buoys......................</td>
<td>152</td>
<td>253</td>
<td>429</td>
</tr>
<tr>
<td>Reduce comm. fish. permits................</td>
<td>224</td>
<td>418</td>
<td>295</td>
</tr>
</tbody>
</table>

“Strongly disagree” and “strongly agree” scores were summed to arrive at high extremity. “Disagree” and “agree” scores were summed to arrive at medium extremity.

To test Ha3, a Kruskal-Wallis procedure was performed to test for differences in attitude extremity according to integrative complexity level for each of the nine sub-items under Question 9. There were significant differences in eight of the nine questions, and Ho3 is rejected. Because post-hoc tests for Kruskal-Wallis are not available in most statistical packages, follow-up Mann-
Whitney U tests were conducted to evaluate pairwise differences among the three integrative complexity levels using the Bonferroni approach to control for Type 1 error across tests (Horn, 2011; Ho, 2011). Significant differences were observed in 23 of the 27 comparisons, and all of these differences were in the predicted direction (Table 29). These results support the acceptance of Ha3.

**Table 29. Kruskal-Wallis tests for median rank differences in attitude extremity according to integrative complexity level.**

<table>
<thead>
<tr>
<th>Item</th>
<th>Level of complexity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
</tr>
<tr>
<td>Close more reefs to diving</td>
<td>312.79*</td>
</tr>
<tr>
<td>Issues fewer fishing licenses</td>
<td>378.19</td>
</tr>
<tr>
<td>Daily quota of divers at reefs</td>
<td>349.48</td>
</tr>
<tr>
<td>Reduce commercial catch</td>
<td>349.34</td>
</tr>
<tr>
<td>Fewer dive companies</td>
<td>385.68</td>
</tr>
<tr>
<td>No party fishing boats in Keys</td>
<td>350.46</td>
</tr>
<tr>
<td>Fewer charter fishing boats</td>
<td>357.66</td>
</tr>
<tr>
<td>Reduce mooring buoys</td>
<td>453.55</td>
</tr>
<tr>
<td>Reduce comm. fishing permits</td>
<td>391.78</td>
</tr>
</tbody>
</table>

*Medians underscored by same line are not significantly different. Median scores are based on a 1-3 scale, with the categories, with the categories 1 = “High Attitude Extremity,” 2 = “Medium Attitude Extremity,” and 3 = “Neutral.” Test result statistics reflect the sums of the median ranks.

**Value Orientation (Ha4)**

It was predicted that those who exhibit higher levels of integrative complexity would tend to exhibit a biocentric value orientation. A Kruskal-Wallis procedure was performed to test for differences in value orientation according to integrative complexity level. Significant differences were found, and Ho4 is rejected. Follow-up Mann-Whitney U tests were conducted to evaluate pairwise differences among the three integrative complexity levels using the Bonferroni approach to control for Type 1 error. Significant differences between each level of complexity, in the direction predicted, were found (Table 30). This result supports the acceptance of Ha4.
Table 30. Kruskal-Wallis tests for median rank differences in value orientation according to index integrative complexity level.

<table>
<thead>
<tr>
<th>Item</th>
<th>Level of complexity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
</tr>
<tr>
<td>Value Orientation Score</td>
<td>352.60*</td>
</tr>
</tbody>
</table>

*Median scores underlined by same line are not significantly different. Median scores are based on a -4 to +4 scale, with the categories -4 = “very strong anthropocentric,” -3 = “strong anthropocentric,” -2 = “moderate anthropocentric,” -1 = “weak anthropocentric,” 0 = “neutral,” 1 = “weak biocentric,” 2 = “moderate biocentric,” 3 = “strong biocentric,” and 4 = “very strong biocentric.” Test result statistics reflect the sums of the median ranks.

**Value Extremity (Ha5)**

It was predicted that those who indicate higher levels of integrative complexity would exhibit value moderacy. To test Ha5, two Kruskal-Wallis procedures were performed to test for differences in value extremity according to integrative complexity level. Results were mixed. Significant differences were found, and Ho5 is rejected. Follow-up Mann-Whitney U tests were conducted to evaluate pairwise differences among the three integrative complexity levels using the Bonferroni approach to control for Type 1 error. For anthropocentric value orientation, the significant difference was observed between moderately complex and very complex cases. However, this difference was in the opposite direction than was predicted. For biocentric value orientation, significant differences were observed across all three integrative complexity levels, and these differences were all in the direction predicted (Table 31). These results indicate partial support for accepting Ha5.
Table 31. Kruskal-Wallis tests for median rank differences in value extremity according to integrative complexity level.

<table>
<thead>
<tr>
<th>Item</th>
<th>Level of complexity</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>V</td>
<td>H</td>
<td>H</td>
<td>p</td>
</tr>
<tr>
<td>Anthropocentric</td>
<td>.496.31*</td>
<td></td>
<td>444.31</td>
<td>413.13</td>
<td>10.618</td>
</tr>
<tr>
<td>orientation ..........</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biocentric</td>
<td>.385.06</td>
<td>413.69</td>
<td>512.67</td>
<td>37.464</td>
<td>.000</td>
</tr>
<tr>
<td>orientation ...........</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Median scores underlined by same line are not significantly different. Median scores are based on a 1-3 scale, with the categories with the categories 1 = “High Attitude Extremity,” 2= “Medium Attitude Extremity,” and 3= “Neutral.” Test result statistics reflect the sums of the median ranks.

Mediated Communication (Ha6)

It was predicted that use of mediated communication would differ according to integrative complexity level. To test Ha6, a Kruskal-Wallis procedure was performed to test for differences in scores according to integrative complexity level for each of the nine mediated communication indicators. Significant differences were found in all nine items and Ho6 is rejected. Follow-up Mann-Whitney U tests were conducted to evaluate pairwise differences among the three integrative complexity levels using the Bonferroni approach to control for Type 1 error across tests. Differences were significant in 22 of the 27 comparisons and of these differences were in the predicted direction (Table 32). These results indicate support for accepting Ha6.
Table 32. Kruskal-Wallis tests for median rank differences in mediated communication according to integrative complexity level.

<table>
<thead>
<tr>
<th>Item</th>
<th>M</th>
<th>V</th>
<th>H</th>
<th>H</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fishing/Diving Magazines ..........</td>
<td>.384.61*</td>
<td>424.44</td>
<td>476.72</td>
<td>14.784</td>
<td>.001</td>
</tr>
<tr>
<td>Agency Publications ..............</td>
<td>.347.10</td>
<td>418.85</td>
<td>492.80</td>
<td>34.917</td>
<td>.000</td>
</tr>
<tr>
<td>Conservation Publications ........</td>
<td>.311.10</td>
<td>402.16</td>
<td>509.98</td>
<td>68.880</td>
<td>.000</td>
</tr>
<tr>
<td>Newspapers</td>
<td>.346.03</td>
<td>427.22</td>
<td>473.45</td>
<td>23.984</td>
<td>.000</td>
</tr>
<tr>
<td>Fishing/Diving Shops</td>
<td>.378.99</td>
<td>418.32</td>
<td>462.43</td>
<td>12.024</td>
<td>.002</td>
</tr>
<tr>
<td>Club Meetings</td>
<td>.423.54 a</td>
<td>413.24</td>
<td>446.79</td>
<td>5.034</td>
<td>.081</td>
</tr>
<tr>
<td>Televisions</td>
<td>.378.04</td>
<td>419.29</td>
<td>470.32</td>
<td>15.285</td>
<td>.000</td>
</tr>
<tr>
<td>Radio</td>
<td>.365.39</td>
<td>422.06</td>
<td>470.57</td>
<td>18.055</td>
<td>.000</td>
</tr>
<tr>
<td>Internet</td>
<td>.366.01</td>
<td>427.75</td>
<td>462.18</td>
<td>13.894</td>
<td>.001</td>
</tr>
</tbody>
</table>

*Medians underscored by same line or that share the same superscript are not significantly different. Median scores are based on a 1-5 scale, with the categories 1 = “no use,” 2 = “almost no use,” 3 = “a little use,” 4 = “some use,” and 5 = “a lot of use.” Test result statistics reflect the sums of the median ranks.

Defensive Attribution of Responsibility (Hα7)

It was predicated that people will assign more blame for the present condition of the Florida Keys coral reef ecosystem to the two other user groups than to their own group. To test Hα7, three Kruskal-Wallis procedures were performed to test for differences in blame according to group affiliation (recreational angler, SCUBA diver, commercial fishermen) on blame. Significant differences were found and therefore H07 was rejected. Follow-up Mann-Whitney U tests were conducted to evaluate pairwise differences among the three groups using the Bonferroni approach to control for Type 1 error across tests. The results were mixed, and indicate that a) commercial fishermen blamed recreational angling and SCUBA diving significantly more than commercial fishing b) there is no statistical difference in how SCUBA divers blamed each activity, and c) anglers blamed SCUBA divers significantly more but not commercial fishing (Table 33). Therefore, insufficient support is observed for fully accepting Hα7, though there is support for partial acceptance.
Table 33. Kruskal-Wallis tests for median rank differences in between-group attribution of responsibility for Florida Keys’ coral reef decline.

<table>
<thead>
<tr>
<th>“Blame to” Item</th>
<th>Anglers</th>
<th>Divers</th>
<th>Commercial</th>
<th>H</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recreational Fishing</td>
<td>416.39*</td>
<td>512.07</td>
<td>402.22 *</td>
<td>19.278</td>
<td>.000</td>
</tr>
<tr>
<td>SCUBA Diving</td>
<td>405.42</td>
<td>410.76</td>
<td>438.39</td>
<td>2.478</td>
<td>.290</td>
</tr>
<tr>
<td>Commercial Fishing</td>
<td>418.82</td>
<td>450.12</td>
<td>294.21</td>
<td>43.112</td>
<td>.000</td>
</tr>
</tbody>
</table>

*Median scores underscored by same line or by that share the same superscript are not significantly different. Median scores are based on a 1-5 scale, with the categories 1 = “no negative impact,” 2 = “slight negative impact,” 3 = “moderate negative impact,” 4 = “heavy negative impact,” and 5 = “Very heavy negative impact.” Test result statistics reflect the sums of the median ranks.
CHAPTER 6
DISCUSSION

The Integrative Complexity Index

Functionality

Using the integrative complexity index, the null hypothesis was rejected and the alternative hypothesis was accepted or partially accepted in five out of the six integrative complexity hypotheses. Given that a review and synthesis of the integrative complexity literature suggests these findings, the index developed for this research would seem to be a good indicator of cognitive complexity. And, while the results of the reliability/validity analyses for the integrative complexity index suggest that some modification is in order (of particular interest is the low performance observed when Information Seeking was involved), Cronbach’s Alpha scores are still in the moderate, rather than low, range. Improving the index should lead to still stronger results.

Levels of Integrative Complexity among Respondents

It would appear that the percentages of respondents falling into low, medium, and high integrative complexity levels are not consistent with other studies. Tetlock (1986) has opined that people prefer integratively simple styles of reasoning and that it is not unusual for 50% or more of the integrative complexity scores to be at the lowest value of the scale. Similarly, in their research on Illinois wildlife issues, Bright and Barro (2000) found that approximately 70% of their sample had low integrative complexity scores. In this dissertation research, the percentage of respondents falling into the lowest two levels of the index was 26.3% across all respondents. This pattern was repeated when integrative complexity was examined by group: 27.5% of anglers fell into the lowest levels, while 23.7% and 29.0% of SCUBA divers and commercial fishermen, respectively, were observed in the lowest levels. This result may be an artifact of the
study area, which is geographically small and contains an involved population whom are fairly knowledgeable about the issues facing their marine environment. Unfortunately, there is little literature with which to compare and generalize how respondents fall into complexity levels between qualitatively vs. and quantitatively-derived integrative complexity. For example, Carroll and Bright (2010) do not report these breakdowns in their scalar approach to measuring integrative complexity.

**Integrative Complexity and Attributions of Responsibility**

The primary theoretical focus of this study was the relationship between two bodies of knowledge—integrative complexity and attribution theory (via attributions of responsibility). When integrative complexity and attributions of responsibility were connected, no significant attribution differences were observed between IC levels and Ho1 could not be rejected. However, attribution pattern score trended positive from moderate complexity to very complex, as expected, but dropped between very complex to highly complex cases. These findings indicate that more work to elucidate the connections between integrative complexity and attribution pattern is merited.

Given that theory would seem to predict a progression from external to internal attribution pattern in conjunction with a progression from low to high integrative complexity, this leaves the question: why was such a relationship not observed? Several considerations may be relevant to understanding these findings. First, among these is the measurement of integrative complexity. Despite the onerous nature of the traditional measure of the construct, it has enjoyed theoretical and methodological attention for several decades. In that time, much work on coding, scaling, and validation has been accomplished. For this dissertation, a new measure was developed and used. Given the results of the index validation, it is possible that, despite the fact that several of the other tests resulted in the acceptance of the alternative hypotheses according to
integrative complexity, the new measure did not sufficiently tap into an individual’s integrative complexity for the purpose of testing Ha1.

Second, it may be that refinement of the attribution question is in order. For example, rather than asking respondents about the negative impacts associated with three already-listed groups, the question could be phrased to inquire what water-based activities are to blame for coral reef decline. Respondents would then be asked to a) list these activities and b) (in a separate component of the question) indicate a magnitude of blame for each activity listed. The measure of attribution style would then be some combination of (a) and (b).

Finally, there may be some error that is inherent to measuring blame using a mail survey instrument. It may be that blame is a topic best understood by face-to-face interviewing, with a separate survey sent to measure integrative complexity. Blame itself can be nuanced and contradictory. For example, blaming may be seen by some as akin to gossip. Or, some respondents may feel that blaming other groups via a written measure illustrates conflict, despite the fact that the survey is confidential. It is not clear how valid this last reason is. After all, theories of attribution (e.g., Shaver’s 1975 defensive attribution hypothesis) predict that people will tend to avoid blame, and that is confirmed in the results of this dissertation.

**Number of Causes**

A link between attribution and number of recorded causes for coral reef decline was supported: the number of recognized causes was significantly and positively correlated with integrative complexity. This finding is consistent with studies that have examined the relationship between complexity of knowledge and psychological response (McClure et al., 1991) and the linkages between knowledge and political tolerance (Bobo and Licari, 1989). Because integratively complex people would be expected to actively listen and seek out topical information, these findings make sense, and again speak to the function of the measures of integrative complexity employed here.
A main difference between the Bobo and Licari approach to the one used here is that is that Bobo and Licari treated knowledge itself as a proxy for cognitive sophistication. However, since only a couple of the hallmarks of cognitive sophistication directly relate to knowledge, it is likely that some amount of error will necessarily and consistently be associated with such a uni-dimensional measure. This favors a more comprehensive approach to cognitive sophistication/integrative complexity, such as an index, composite measure, or even the traditional qualitative method.

**Attitude Extremity**

Significant differences, in the direction predicted, were found when attitude extremity was tested according to integrative complexity. This finding is supported and predicted by the literature, where it has been suggested that moderate attitudes are characterized by more complex belief systems than are extreme attitudes (Bright and Manfredo, 1992; Linville, 1982). For example, in their study of integrative complexity and the Endangered Species Act, Bright and Tarrant (2002) found that respondents who held moderate attitudes showed significantly higher integrative complexity toward the ESA than did those with extreme attitudes. Similarly, Bright and Manfredo (1992) found that moderate attitudes toward a variety of natural resource management issues are characterized by higher cognitive complexity than are extreme attitudes.

The connection between attitude extremity and integrative complexity is fairly intuitive: a person who has a well-developed personal representation of an attitude object is probably less likely to engage in thought or behavior that characterizes integratively complex thinking, such as seeking out new information about the object or actively listening to opposite views. However, the linkage between moderate attitudes and integrative complexity is less clear. Such moderacy may stem from the lack of a well-developed representation of the attitude object. On the other hand, an ambivalent attitude may also result when an individual understands the tenability of contradictory arguments for an issue – a characteristic of integratively complex thinking (Tetlock,
1983). Here, we have somewhat of a chicken-and-the-egg problem. Does attitude ambivalence lead to integrative complexity (via the understanding of such tenability) or does integrative complexity arise from other factors and subsequently result in attitude ambivalence? Regardless, the above-described conditions certainly predict that different levels of integratively complex thinking about coral reef management in the Florida Keys should be related to the extremity/moderacy of one’s attitude toward that issue and that was indeed observed.

**Value Orientation and Extremity**

As mentioned previously, literature that examines the relationship between integrative complexity and value orientation is fairly thin and somewhat contradictory. For example, Tetlock (1984) found moderate Parliamentarians were more integratively complex than more liberal legislators despite having previously found that conservative American politicians were less integratively complex that those on the left. The literature that examines the relationship between integrative complexity and value extremity is practically non-existent and this dissertation provided an opportunity to explore the connection.

The results of this study are in line with the contradictory nature of the integrative complexity-value literature. The Kruskal –Wallis test found significant differences when value orientation was examined according to integrative complexity. However, when value extremity was examined, significant differences in the direction predicted were observed only for the biocentric value item. This finding may be explained in the fact that values tend to be more abstract concepts than attitudes (Eagly and Kulesa, 1997), hence their position relative to attitudes in the Cognitive Hierarchy Model (Vaske and Donnelly, 1999). It may be that this abstractness must be accounted for when testing for differences in value extremity according to integrative complexity.
Mediated Communication

Use of mediated communication differed significantly according to integrative complexity level, and the null hypothesis was rejected. All 22 significant differences were in the direction predicted. It does not appear that the connection between mediated communication and integrative complexity has been studied previously. However, two of the integrative complexity dimensions operationalized in this dissertation – information seeking and active listing – would seem to be closely connected to mediated communication. These results provide further evidence that the integrative complexity measures as developed for this research are in fact tapping into some element of the construct.

Group Affiliation and Attributional Pattern (Defensive Attribution of Responsibility)

When the effect of group affiliation on blame was examined, the null hypothesis of no difference according to group was rejected. Significant differences in the direction predicted were observed. These differences occurred in three of the six relevant comparisons: anglers blamed SCUBA diving more but not commercial fishing; SCUBA divers did not exhibit any differences in blame; and commercial fishermen blamed both recreational fishing and SCUBA diving more.

These findings are supported by several theoretical avenues of inquiry within the disciplines of sociology and social psychology. For example, Asch (1952) notes that groups form shared positions, relations, norms, and values. Moreover, groups tend to develop a socially-shared cognition (Fiske, 2004). One aspect of this concept is shared reality, in which otherwise subjective experiences are socially verified through joint experiences and come to be perceived by group members as objective (Hardin and Higgins, 1996). Ingroup bias, stemming from work on social identity and intergroup relations (e.g., Tajfel, 1970; 1974; 1978) also sheds light on these findings. Ingroup bias is a result of a tendency to hold positive attitudes towards own-group members and to feel contempt, opposition, or a desire to compete with other groups.
The ingroup bias hypothesis may also be responsible for one aspect of these results. Recall that the one counter-finding was that anglers blamed recreational fishing slightly more than did commercial fishermen. Under this reasoning, recreational anglers may see commercial fishermen as part of their larger “fishing ingroup” and thus might be less willing to blame them. The fact that the mean blame assigned by anglers to recreational fishing and commercial fishing (M = 2.820 vs. 2.593 respectively) lends some support to this possible interpretation.

**Future Research**

Findings from this study point to several areas deserving of future research attention. First, the findings observed when attribution style was examined according to integrative complexity indicate that the area of inquiry should not be abandoned. Integrative complexity did numerically increase from moderately to very complex respondents, and theory and research in related conceptual areas do suggest a connection. One potential approach to establishing this linkage is to use the traditional, qualitative approach to measuring integrative complexity, to determine if favorable results are achieved with this method. At the same time, the literature does not indicate that much methodological attention has been paid to comparing qualitative and quantitative approaches to measuring IC, and this area appears to hold much research potential.

The rejection of several of the integrative complexity null hypotheses also points to the importance of refining the index developed for this research. The need still remains to develop a reliable and valid way to more easily segment individuals on an integrative complexity spectrum. The construct has sustained decades of research interests and is a useful predicator of any number of psychological attributes and behaviors. There are several areas in which the approach described and implemented here could be improved upon. For example, while IC characteristics used in this study (i.e., information seeking; active listening; problem solving; and position moderacy) were chosen quite deliberately, perhaps other combinations of characteristics would be
better predictors. Or, perhaps the current characteristics and their response categories could be worded better. Finally, more attention may be needed with respect operationalizing the IC attributes of integration and differentiation in an index measure.

Future research may also want to address the way in which external vs. internal blame across groups is measured. The approached used in this study was reasonable, but can be improved upon. More information about making such improvements can be found in the Discussion section above.

The relationship between integrative complexity and subject knowledge warrants further investigation. As discussed above, some authors have treated subject knowledge as cognitive complexity. However, the literature suggests that subject knowledge is more appropriately understood as a variable or sub-variable in integrative complexity. In a related area, mediated communication, which has clear connections to subject knowledge and several IC characteristics, does not appear to have sustained much research interest in the social sciences to date. Given the significant findings this study observed between mediated communication and integrative complexity, as well as the potential for mediated communication to influence attitudes and other psychological constructs, future investigators may consider incorporating a battery of mediated communication questions in applied cognitive research.

That groups tended to blame one another is perhaps not surprising. However, the question of why anglers blamed recreational fishing more that commercial fishermen perhaps deserve research consideration from a social-psychological perspective. The dissertation survey did not ask respondents about their perceived similarity with the other two groups, which may have helped to explain this finding. Attribution patterns may be sensitive to such perceived similarity. For example, anglers and commercial fishermen may feel they have more in common with each other than they do with SCUBA divers, and commercial fishermen may feel they have more in common with commercial dive operators than with individual SCUBA divers. Future
research on group attribution should examine commonality among the groups as a means to better understand observed blame patterns.

The value extremity findings are enticing. The directionality of the median differences suggests a connection to integrative complexity. It is reasonable to assume that future research that expands and improves upon the measures of value extremity and integrative complexity will find a significant difference in the predicted direction.

Finally, attributional findings may tell us much about intra-group conflict. However, it appears that little work has been undertaken in natural resource management to incorporate defensive attribution or attribution style into measures of conflict. Certainly, the nature of observed attribution patterns can be correlated with conflict that arises from either goal interference or differences in social values. Conflict that is a product of one or the other may result in different attributional findings.

**Management Implications**

While some caution is in order when discussing the implications of the study results to resource managers in the Florida Keys, this research does have some applied relevance. First, and perhaps most importantly, the results of developing, implementing, and testing the scalar integrative complexity index support its use by managers to segment recreational and commercial constituents into cognitive complexity levels. When care is taken to use it on a representative sample, it should assist in providing information about those constituents across any number of human dimensions inquiries. If, for example, marine resource managers in the Florida Keys find that resource users are higher in the traits of integrative complexity, those users can be expected to be willing to listen to each other’s concerns and to compromise on issues of management relevance.

Another area of this study that should interest managers is the hypothetical management alternatives questions. Again, no generalizations can be made back to the larger populations.
However, it would be both interesting and of management value if the response pattern that emerged by group across these questions in this study was found in a representative study.

Mediated communication questions are also important generally, as they indicate specifically where managers may wish to focus communication, outreach, and education efforts and budgets when used on representative samples. They are often included in surveys of resource users by the Human Dimensions Program in the Department of Environmental Conservation at the University of Massachusetts Amherst. For example, Loomis et al. (2008) used mediated communication findings to inform Florida Keys National Martine Sanctuary managers and other interested parties how much use SCUBA divers, snorkelers, and recreational anglers were making of particular information outlets.

Another survey topic that was not presented above (results tables can be found in Appendix C) but that warrants some mention here because of its management applicability, is Question 11 regarding beliefs about coral reef and marine resource management in the Florida Keys. Resource managers may wish too periodically gauge public confidence in ongoing efforts to achieve noticeable progress towards restoring coral reef ecosystems, reducing conflict among different coral reef user groups, and improving water quality, as well as a dissatisfaction with current efforts to manage the Keys’ marine environment. These data help managers adjunct program efforts, including improving communication about conservation successes.

Finally, a practical reason to employ an attributional questionnaire is for management use as a measure of potential conflict between stakeholder groups. As Watson (2001) notes, conceptual definitions of natural resource conflict have been around for several decades, but a standardized measure of different types of conflict remain elusive. Watson goes on to state that there is a need to advance methodologies that measure conflict at the subpopulation level and that these measures need to be employed at the group level in acknowledgement that conflict often is influenced by the dynamics and the cumulative attitudes and experiences of groups. Attribution approaches using vignettes or scenarios may provide a vehicle to gauge the strength and
symmetry of between-group conflict. Significant and meaningful differences in blame between groups could suggest the potential for strong conflicts between resource users at local and regional scales.

**Conclusion**

In conclusion, this study found some support for a connection between integrative complexity and attribution. The number of recognized causes for coral reef decline in the Florida Keys increased significantly with higher levels of complexity. However, the primary, and perhaps most interesting, attribution hypothesis was not confirmed, as Ha1 could not be accepted. Support was found for a connection between integrative complexity and mediated communication, and significant differences were found when integrative complexity was compared to attitude extremity and value orientation. However, no connection was established between value extremity and integrative complexity.

This research also broke new ground on measuring integrative complexity. A scalar measure was developed and was examined for inter-item reliability and construct validly. Although those analyses suggest that work is still in order, the confirmation of five of the six IC alternate hypotheses supports moving forward with this type of measurement approach.

Finally, the nature of intra-group blaming, as evidenced by Ha7 results, may serve as a measure of potential group conflict from managers and theorists. Differences in blame scores do not indicate the potential for severe conflict at this time. Although it may be that groups such as recreational anglers, SCUBA divers, and commercial fishermen will blame each other, the nuance observed in the findings was interesting and may inform the development of new research, as described above.
APPENDIX A

SURVEY INSTRUMENT

FLORIDA KEYS CORAL REEFS:
USE, CONDITION, AND MANAGEMENT

Holdsworth Natural Resources Center
Human Dimensions of Marine and Coastal Ecosystems Program
University of Massachusetts Amherst
Amherst, MA 01003
The information you provide us will remain strictly confidential and your name will never be associated with your answers. First, please tell us about your fishing or diving activity and where you get your information about fishing or SCUBA diving.

1. Do you
   1. Fish recreationally (saltwater) Yes...If yes, about how many days per year __
      No
   2. SCUBA dive Yes...If yes, about how many days per year __
      No

2. Of the two, which do you consider your primary activity?
   1. Recreational fishing
   2. SCUBA diving

Please answer the remaining questions from the perspective of your primary activity, as indicated in Question 2.

3. To what extent do you make use of the following for current information about fishing/diving in the Florida Keys?

   a. Fishing/diving magazines................................. 1 2 3 4 5
   b. Government agency publications.......................... 1 2 3 4 5
   c. Conservation organization publications.................. 1 2 3 4 5
   d. Newspapers............................................... 1 2 3 4 5
   e. Fishing/diving shops ...................................... 1 2 3 4 5
   f. Club meetings .............................................. 1 2 3 4 5
   g. Television .................................................. 1 2 3 4 5
   h. Radio.......................................................... 1 2 3 4 5
   i. Internet ...................................................... 1 2 3 4 5
   j. Talking with other fishermen/divers..................... 1 2 3 4 5
We would like to know how you approach issues that involve fishing/diving and coral reefs. For each question below, read the four choices and circle the one answer that best fits you for that question.

4. When it comes to issues that affect fishing/diving,
   1. I do not keep up with current events about fishing or diving in the Florida Keys
   2. I have some knowledge of current events about fishing or diving in the Florida Keys
   3. Knowing about current events about fishing or diving in the Florida Keys is important to me, so I discuss these events with friends and colleagues whenever I can
   4. I seek to know all I can about current events about fishing or diving in the Florida Keys and I usually spend time actively researching fishing/diving issues in order to draw the most complete conclusions

5. There are differences in what people find to be acceptable uses of coral reefs. If others were to suggest using a coral reef in a way that I found disagreeable, I usually
   1. Am not particularly receptive to their point of view or their arguments. I have heard them all before and I already know what I think and believe
   2. Will listen to others’ points of view, but I usually have made up my mind before-hand
   3. Am almost always receptive to others’ points of view. I will reserve judgement until I understand their perspective
   4. Find that it is important to me to always listen to and understand their arguments and to try to incorporate their views into my thinking

6. There are many examples where two or more groups have a conflict over coral reef issues. Please tell us which of the following would best describe you if you were involved in a dispute over coral reefs.
   1. I am not interested in new or creative ways to solve these conflicts. What we have been doing until now is OK with me
   2. I might be willing to entertain new approaches to solving these conflicts, but I doubt anything will come of them
   3. New ways to solve these conflicts wouldn’t hurt, but I would have to think about these ideas and whether they might be better
   4. Finding new and creative ways to solve these problems is a must because our current approaches are not working well
7. If coral reef managers proposed new or additional regulations that restricted use at my favorite spot, my first thoughts would likely be

1. I am not interested in hearing about such proposals. Coral reef managers are almost never looking out for people who use and rely on reefs, so I would be skeptical about such regulations.
2. I’m not sure there is a need to change how that place is currently managed, but I would be interested in hearing managers’ rationale.
3. Some new management action might be necessary and I might be supportive if compelling information was presented to me.
4. I have come to realize that we must do some things differently in managing our coral reefs. I would be open to such regulations if they are necessary, even if they would not be the best outcome for me personally.

Coral reefs in the Florida Keys are generally accepted as being in declining health. Research indicates that since the 1950s, live coral cover has decreased significantly, water quality is poorer, there are fewer large fish to catch, and algae has increased. This decline has affected a number of recreational pastimes and commercial livelihoods.

8. Please indicate how much of a negative impact you feel each group listed below has had in terms of the decline of coral reefs in the Florida Keys.

<table>
<thead>
<tr>
<th>Commercial fishermen</th>
<th>Minimal</th>
<th>Moderate</th>
<th>High</th>
<th>Very high</th>
<th>Extremely high</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Trap fishermen</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>b. Hook and line fishermen</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>c. Trawl fishermen</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>SCUBA diving</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Private boat divers</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>e. Dive shop divers</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>f. Shore divers</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Recreational anglers</th>
<th>Minimal</th>
<th>Moderate</th>
<th>High</th>
<th>Very high</th>
<th>Extremely high</th>
</tr>
</thead>
<tbody>
<tr>
<td>g. Private boat anglers</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>h. Party-boat anglers</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>i. Charter boat anglers</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>
9. Based on your answers to Question 8 above, please indicate the extent to which you disagree or agree with the following hypothetical management alternatives.

<table>
<thead>
<tr>
<th>Option</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. More reef areas should be closed to diving</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>b. Fewer recreation fishing licenses should be issued</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>c. A daily quota of SCUBA divers at natural coral reefs should be implemented</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>d. The government should reduce the amount of fish that commercial fishermen may take from the waters of the Florida Keys</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>e. The number of dive companies should be reduced in The Florida Keys</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>f. Party fishing boats should not be allowed in the Florida Keys</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>g. The number of charter fishing boats should be reduced in the Florida Keys</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>h. The number of mooring buoys should be decreased within Florida Keys’ reefs</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>i. The number of commercial fishing permits should be decreased within Florida Keys’ waters</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

10. In addition to recreational/commercial fishing and SCUBA diving, there may be other causes for coral reef decline. We are interested in understanding what you believe these to be.

________________________, ________________________, ________________________,
________________________, ________________________, ________________________,
________________________, ________________________, ________________________,
________________________, ________________________, ________________________,
These next several questions ask you for your perceptions of coral reef conditions and the effectiveness of coral reef management efforts in the Florida Keys based on your experience fishing/diving and/or discussions with others.

11. Please indicate the extent to which you agree or disagree with the following statements. DK = “don’t know.”

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>DK</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Efforts to manage coral reefs in the Keys have achieved noticeable progress towards restoring coral reef ecosystems</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. The preferences and views of the public should be an important consideration for coral reef managers in the Florida Keys</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Coral reef management efforts in the Florida Keys have reduced conflict among different user groups, such as fishermen and divers</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Tourism is important to the Florida Keys, so economic issues should be an important factor in Sanctuary decision-making</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Sanctuary managers should take into account only what is good for nature</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. Most people that I know are satisfied with current efforts to manage the marine environment in the Florida Keys</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. The Florida Keys National Marine Sanctuary has been successful in improving water quality</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Managing the coral reefs of the Florida Keys is a complex task and those in charge of these efforts are mandated by law to include the public in decision-making. Part of this research aims to understand both what and how the public thinks about complex issues. Please circle the letter next to the one set of statements below that you feel best describes you.

a. I wish people would not “talk issues to death,” because there is usually a right and a wrong answer to most problems. There are usually only a couple of relevant factors in any problem and I don’t need to spend a lot of time figuring out how they fit together to decide how I feel about an issue.

b. Other people might have some good ideas, so I am usually willing to spend some time hearing from them before I make up my mind. However, I still think people waste a lot of time considering all of the things that a decision will affect. There is no way to consider everything and most of these factors aren’t important anyway.

c. I like to hear from all sides before I reach a decision. The consequences and implications of most decisions are important to think about because there are rarely any black or white answers to problems — only shades of gray. These implications need to be integrated into any discussion about the problem.

Finally, we would like to ask a few questions about you and where you live. This will help us better interpret our results.

13. Are you
   1. Male
   2. Female

14. Are you a resident of the Florida Keys? Yes No

   If yes, about how many years have you lived in the Florida Keys? _____ Years

15. If you are not a resident of the Florida Keys, please tell us approximately how many times you have been to the Florida Keys.

   _____ Times
That's it! Thank you for your assistance with this research. If there is anything else that you would like to share about coral reef management in the Florida Keys, feel free to tell us in this space.

---

Please direct all inquiries to: Christopher Hawkins
160 Holdsworth Way
University of Massachusetts Amherst
413.545.4939; Hawkins@nrc.umass.edu
Dear «First»:

The University of Massachusetts is conducting a survey of people who fish and dive on the reefs of the Florida Keys. You are being sent this survey because you have a boat registered to you in Monroe County. We hope you will take a few minutes to help us with this project. The survey contains less than 20 questions. This survey is designed to tell us about your thoughts about coral reef use and coral reef management in the Florida Keys.

Enclosed you will find a questionnaire and a stamped, self-addressed envelope. Please complete and return the survey at your earliest convenience. You should be able to complete it in 10-15 minutes.

You may be assured of complete confidentiality. The questionnaire has an identification number for mailing purposes only. This is so the staff at the University of Massachusetts can check your name off the mailing list when your questionnaire is returned. Your name and address will never be placed on or associated with the questionnaire, nor will the information you provide be used for any other purposes.

Please feel free to contact me at Loomis@nrc.umass.edu or 413-545-3749 with any questions or comments about the survey or research project. Thank you in advance for your participation!

Sincerely,

Dr. David K. Loomis

Encl.
Dear «First»:

The University of Massachusetts is conducting a survey of people who fish and dive on the reefs of the Florida Keys. Your name was included in a database of people who either have a boat registered to them in Monroe County or who have a State of Florida saltwater fishing license. We hope you will take a moment to complete this survey. It contains less than 20 questions.

This survey is designed to tell us about your thoughts about coral reef use and coral reef management in the Florida Keys.

Enclosed you will find a questionnaire and a stamped, self-addressed envelope. Please complete and return the survey at your earliest convenience. You should be able to complete it in 10-15 minutes.

You may be assured of complete confidentiality. The questionnaire has an identification number for mailing purposes only. This is so the staff at the University of Massachusetts can check your name off the mailing list when your questionnaire is returned. Your name and address will never be placed on or associated with the questionnaire, nor will the information you provide be used for any other purposes.

Please feel free to contact me at Loomis@nrc.umass.edu or 413-545-3749 with any questions or comments about the survey or research project. Thank you in advance for your participation!

Sincerely,

Dr. David K. Loomis

Encl.
Respondents Previously Surveyed for a Different Project

Month, Day, Year
«First» «Last»
«Address»
«City», «ST» «ZIP»

Dear «First»:

The University of Massachusetts is conducting a survey of people who fish and dive on the reefs of the Florida Keys. Your name was obtained either in one of our past trips to the Keys or you sent in a postcard agreeing to participate in our research. If you completed a past survey for us, please accept our thanks. Those reports are now available on our website at www.umass.edu/hd.

We hope you will take a few minutes to help us with this new project. It contains less than 20 questions. This survey is designed to tell us about your thoughts about coral reef use and coral reef management in the Florida Keys.

Enclosed you will find a questionnaire and a stamped, self-addressed envelope. Please complete and return the survey at your earliest convenience. You should be able to complete it in 10-15 minutes.

You may be assured of complete confidentiality. The questionnaire has an identification number for mailing purposes only. This is so the staff at the University of Massachusetts can check your name off the mailing list when your questionnaire is returned. Your name and address will never be placed on or associated with the questionnaire, nor will the information you provide be used for any other purposes.

Please feel free to contact me at Loomis@nrc.umass.edu or 413-545-3749 with any questions or comments about the survey or research project. Thank you in advance for your participation!

Sincerely,

Dr. David K. Loomis

Encl.
Dear «First»:

The University of Massachusetts is conducting a survey of people who fish commercially in the waters of the Florida Keys. This survey is designed to tell us about your thoughts about coral reef use and coral reef management in the Florida Keys.

Enclosed you will find a questionnaire and a stamped, self-addressed envelope. Please complete and return the survey at your earliest convenience. There are less than 20 questions on this survey and you should be able to complete it in 10-15 minutes.

You may be assured of complete confidentiality. The questionnaire has an identification number for mailing purposes only. This is so the staff at the University of Massachusetts can check your name off the mailing list when your questionnaire is returned. Your name and address will never be placed on or associated with the questionnaire, nor will the information you provide be used for any other purposes.

Please feel free to contact me at Loomis@nrc.umass.edu or 413-545-4939 with any questions or comments about the survey or research project. Thank you in advance for your participation!

Sincerely,

Dr. David K. Loomis

Encl.
APPENDIX C

BELIEFS ABOUT MANAGEMENT EFFECTIVENESS

Four statements were developed to assess respondents’ evaluation of the efficacy of ongoing coral and marine resource management activities in the Florida Keys. Respondents were asked to provide an evaluation rating for each statement on a 5-point scale, ranging from strongly disagree (1) to strongly agree (5); a neutral option was available in the middle of the scale (3). For all three groups, the data indicate that those sampled question the efficacy of several important Sanctuary management objectives (Tables 34-36).

Table 34. Recreational anglers’ beliefs about management effectiveness.

<table>
<thead>
<tr>
<th>Items</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>% DK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Progress towards restoring coral ecosystems…</td>
<td>2.956*</td>
<td>.988</td>
<td>340</td>
<td>23.94</td>
</tr>
<tr>
<td>Conflict b/t user groups has been reduced….</td>
<td>2.773</td>
<td>.919</td>
<td>301</td>
<td>29.67</td>
</tr>
<tr>
<td>Most people are satisfied with management…..</td>
<td>2.732</td>
<td>1.058</td>
<td>409</td>
<td>15.15</td>
</tr>
<tr>
<td>FKMS has improved water quality…………….</td>
<td>2.776</td>
<td>1.118</td>
<td>257</td>
<td>36.70</td>
</tr>
</tbody>
</table>

*Mean scores are based on a 1-5 scale, with the categories 1 = “strongly disagree,” 2 = “disagree,” 3 = “neutral,” 4 = “agree,” and 5 = “strongly agree.” DK = “don’t know.”

Table 35. SCUBA divers beliefs about management effectiveness.

<table>
<thead>
<tr>
<th>Items</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>% DK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Progress towards restoring coral ecosystems…</td>
<td>2.923*</td>
<td>1.083</td>
<td>130</td>
<td>11.56</td>
</tr>
<tr>
<td>Conflict b/t user groups has been reduced….</td>
<td>2.874</td>
<td>.962</td>
<td>148</td>
<td>18.92</td>
</tr>
<tr>
<td>Most people are satisfied with management…..</td>
<td>2.530</td>
<td>1.015</td>
<td>132</td>
<td>10.20</td>
</tr>
<tr>
<td>FKMS has improved water quality…………….</td>
<td>2.661</td>
<td>1.047</td>
<td>109</td>
<td>25.17</td>
</tr>
</tbody>
</table>

*Mean scores are based on a 1-5 scale, with the categories 1 = “strongly disagree,” 2 = “disagree,” 3 = “neutral,” 4 = “agree,” and 5 = “strongly agree.” DK = “don’t know.”

Table 36. Commercial fishermen’ beliefs about management effectiveness.

<table>
<thead>
<tr>
<th>Items</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>% DK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Progress towards restoring coral ecosystems…</td>
<td>2.671*</td>
<td>1.088</td>
<td>161</td>
<td>6.4</td>
</tr>
<tr>
<td>Conflict b/t user groups has been reduced….</td>
<td>2.559</td>
<td>1.096</td>
<td>152</td>
<td>11.11</td>
</tr>
<tr>
<td>Most people are satisfied with management…..</td>
<td>2.633</td>
<td>1.172</td>
<td>166</td>
<td>4.05</td>
</tr>
<tr>
<td>FKMS has improved water quality…………….</td>
<td>2.247</td>
<td>1.166</td>
<td>158</td>
<td>8.14</td>
</tr>
</tbody>
</table>

*Mean scores are based on a 1-5 scale, with the categories 1 = “strongly disagree,” 2 = “disagree,” 3 = “neutral,” 4 = “agree,” and 5 = “strongly agree.” DK = “don’t know.”
REFERENCES


DiDomenico, G. (2001). Storm trap debris generated from lost and abandoned lobster and stone crab traps in Monroe County. Environmental Problem Solving Group, Florida Department of Environmental Protection, Florida.


Driver, B.L. (1977). Item pool for scales designed to quantify the psychological outcomes desired and expected from recreation participation. Grey literature, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado 80521.


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