

How Resource Dependency Can Influence Social Resilience within a Primary Resource Industry*

N. A. Marshall

*School of Tropical Environment Studies and Geography
James Cook University
Cooperative Research Centre for Reef Research*

D. M. Fenton

*School of Tropical Environment Studies and Geography
James Cook University*

P. A. Marshall

Great Barrier Reef Marine Park Authority

S. G. Sutton

*School of Tropical Environment Studies and Geography
James Cook University
Cooperative Research Centre for Reef Research*

ABSTRACT Maintaining a healthy balance between human prosperity and environmental integrity is at the core of the principles of Ecological Sustainable Development. Resource-protection policies are frequently implemented so as to regulate the balance between resource access and use, however, they can inadvertently compromise the ability of resource users to adapt and be resilient. Resource users who are especially dependent on a resource are more seriously compromised. But how do we define and measure resource dependency? And how do we assess its ability to influence social resilience? In this study, a conceptual model of resource dependency is developed in terms of: (i) occupational attachment, (ii) attachment to place, (iii) employability, (iv) family attitude to change, (v) business size, (vi) business approach, (vii) financial situation, (viii) level of specialisation, (ix) time spent harvesting, and (x) interest in and knowledge of the environment. The model of resource dependency and its effect on social resilience are (quantitatively and qualitatively) tested and explored using the commercial fishing industry in North Queensland, Australia. Results show that occupational attachment and employability were important influences as were business size and approach. Results can be used to identify vulnerability to institutional change and guide policy development processes.

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Resource managers, communities, and resource users alike urgently require prior knowledge of the likely social consequences of their actions if they are to implement resource-protection strategies that maintain the ability of people to cope and adapt to future change (Burdge 1987; Curtis et al. 2000; North 1990). Resilience is a concept that is emerging as an important concept to guide and support more inclusive and effective approaches to the management of combined social and ecological (socio-ecological) systems (Berkes and Folke 1998; Levin et al. 1998; Ludwig, Walker, and Holling 1997). Resilient systems are flexible, prepared for change and uncertainty, and are essential for the prosperous development of society (Gunderson 1999; Folke et al. 2002; Hughes et al. 2005). The concept of managing for socio-ecological resilience relates to the maintenance of system properties that confer resilience without compromising their ability to cope and adapt to future change (Holling 2004; Holling, Berkes, and Folke 1998; Holling and Meffe 1996a). Knowledge of the properties that confer resilience can assist resource-managers, communities and resource users to design and implement policies that minimize the impacts on people while maximizing the sustainability of ecosystem goods and services (Adger 2000; Brunkhorst 2002; Crean 1999).

Social resilience is a complex and multidimensional concept (Carpenter and Brock 2004). The term, "social resilience" in this study refers to individual resilience and the flexibility with which resource users can cope and adapt to changes in resource policy. General resilience theory describes a conceptual model for socio-ecological resilience based on three system characteristics: (i) the amount of disturbance a system can absorb and still retain the same structure and function, (ii) the degree to which the system is capable of self-organization, and (iii) the degree to which the system can build and increase the capacity for learning and adaptation (Carpenter and Gunderson 2001; Folke et al. 2002; Holling 1973). In a related paper, Marshall and Marshall (2007) suggest that resilience of the social components can be readily mapped against this generalized conceptual model but that social systems have an additional unique component. This component is the perception of risk associated with change, and although it was identified through an analysis at the individual scale, it probably has application at larger scales. Marshall and Marshall (2007) specifically define social resilience for individual commercial fishers in North Queensland, Australia, as comprising four key characteristics: (i) the perception of risk associated with change, (ii) the perception of the ability to plan, learn, and reorganize, (iii) the perception of the proximity to the threshold of coping, and (iv) the level of interest in

change. These characteristics describe the likely ability of a fisher to cope with institutional change and adapt.

The Perception of Risk in Approaching Change (First Dimension of Resilience)

Commercial fishers assess their vulnerability to institutional or policy change on the basis of their financial situation, their ability to secure employment elsewhere and their ability to remain competitive within the industry. Fishers with a larger financial buffer feel less vulnerable to policy change since they believe that they can absorb the costs of change more easily and remain viable within the industry. For example, they can purchase bigger fishing vessels and better gear to enable them to travel further in the event of closures to nearer fishing grounds, for example, or increased competition within remaining fishing grounds. Fishers who have developed transferable skills in another trade feel that they can cope if conditions became untenable within the industry by securing employment elsewhere. Many fishers feel, however, that they lack a financial buffer or the necessary skills to successfully see themselves through the transition to a new policy environment.

The Ability to Plan, Learn and Reorganize (Second Dimension of Resilience)

Fishers with well-developed business skills are more positive in their perception of their ability to plan and reorganize in the event of change. These fishers are relatively new to the industry. They have thus already experienced a successful adaptation or transformation, have confidence in their ability to develop creative and novel solutions to deal with changing conditions, and are younger and more enthusiastic about remaining viable within the industry or setting up a business outside of the industry. Those fishers who are less positive in their ability to plan, learn, and reorganize tend to be older fishers (e.g., in which the idea of reorganizing is “exhausting”), are extremely attached to their occupation (e.g., “I wouldn’t swap my life for anything”), or do not have the necessary skills to visualize options available to them (e.g., “I have no idea what else I can do”).

Perception of the Ability to Cope with Change (Third Dimension of Resilience)

Fishers perceive their proximity to their thresholds of coping in financial, emotional, and marital terms. Fishers in a better financial situation (e.g., debt repayments and number of assets) are more

positive about their proximity to their thresholds. Fishers who are confident in their ability to be competitive or adapt outside of the industry are also more positive. Fishers who have experienced marital distress as a result of previous change events believe that their relationship would be unable to endure further change. Fishers who are particularly negative about their ability to cope with policy change are men in their early fifties; they believe that they are mostly unemployable, are too young to retire, access superannuation or pension benefits, and possess too many assets to be eligible for other welfare benefits.

The Level of Interest in Adapting to Change (Fourth Dimension of Resilience)

Fishers who are more interested in adapting to policy change have fewer constraints such as family commitments, attachment to the occupation, and financial leeway. Divorced fishers in particular do not have the flexibility to search for income opportunities elsewhere because it means that it is even more difficult to spend time with their children. Grandparents express similar concerns about maintaining relationships with their grandchildren. Fishers with a high level of attachment to the occupation are inflexible to other options. Fishers who are not in a strong financial position also believe that they can not afford the costs of change, and thus show less interest in adapting.

Issues of scale are critically important in examining the dynamics and adaptive capacity of socio-ecological systems. Socio-ecological systems exist at a number of scales in time, space, and levels of organization, and interact across these multiple scales ("panarchies"). These cross-scale effects are of great significance in the dynamics of socio-ecological systems where it is not possible to understand a system at only one scale (Holling 2004). Aspects of resilience are influenced by what is happening at scales above and below the scale of interest (Walker et al. 2004). Hence, adaptive cycles are variable, complex, non-linear, and dynamic: the outcomes of change being inherently unpredictable. We search to recognize the process of responding to change.

We concentrate on defining and assessing the response of individuals to policy change, as this scale is seldom addressed. Individual responses are important in driving and understanding resilience at higher scales (Adger et al. 2002; Manfredi and Dayer 2004; Meffe 2001). Data collected on individual resource users allows analysis of social resilience at higher levels of organization without masking some of the

fundamental properties that may determine responses to policy change (Freudenburg and Gramling 2002; Machlis, Force, and Balice 1990; Mascia et al. 1990; Trosper 2004). Our focus on individuals also increases the general applicability of results to other social-ecological systems (Bradley and Grainger 2004; Salz 1998; Smith et al. 2003; Smith 1995).

Another important point in appreciating the complexity of adaptive socio-ecological systems is that resilience can be influenced. This paper aims to identify some of the conditions under which resilience might be influenced and looks at, in particular, the effect of resource dependency (Adger 2000). We aim to understand why some individuals are more resilient than others.

Resource dependency is a description of the unique relationship between resource users and a resource (Bailey and Pomeroy 1996; Force et al. 1993; Krannich and Zollinger 1997). Communities that are predominately farming, mining, fishing, or logging communities are typical examples of resource dependent communities (Bailey and Pomeroy 1996). Changing the nature of the relationship between users and a resource can inadvertently compromise human prosperity and affect the ability of social and ecological systems to be resilient (Adger 2000; Boserup 1981; Burdige and Vanclay 1996; Farmer and Albrecht 1998).

Understanding why and how people are dependent on a resource may provide insight into the ability of resource users to cope and adapt to changes in the user-resource relationship (Albrecht and Thompson 1988; Canan and Hennessey 1983; King 1998). It may assist resource managers, communities, and resource users to design and implement resource-protection policies that not only protect ecological values but also the social systems dependent upon them. But how do we conceptualize and measure resource dependency? And how do we assess its ability to influence social resilience? We begin by examining some of the key elements of the relationship between resource users and the resource. These elements are examined in terms of social, economic, and environmental dependencies. We then quantify and examine the relationship (using correlative techniques) between resource dependency and social resilience using the commercial fishing industry in North Queensland.

Attachment to the Occupation (Social Dependency)

Resource users can become especially dependent on a resource because of their level of attachment to their resource-extractive occupation.

Resource users can be affected by their work in such a way that their work relationships, interests and values permeate their non-working lives (Becker and Carper 1956; Gonzalez and Benito 2001; Hughes 1958; Salaman 1974). An attachment to an occupation is usually developed and reinforced by interacting with others within the profession both during working hours and outside of working hours (Becker and Carper 1956; Carroll and Lee 1990; Freudenburg 1992). The more firmly attached a person becomes to his/her occupation, the more traumatic and disorienting a change in occupation is likely to be (Carroll and Lee 1990; Smith 1995; Twigger-Ross and Uzzell 1996). When people with a strong occupational attachment suddenly face the prospect that they are no longer able to continue in their current occupation, they not only lose a means of earning an income, they lose an important part of their self-identity.

The self-identity that is created as a result of working in a resource-extractive industry has been described using four principle components: distinctiveness, continuity, self-esteem and self-efficacy, each of which is important to maintain at a favorable level (Pajak 2000; Twigger-Ross and Uzzell 1996). "Distinctiveness" enables people to differentiate themselves from other people. It describes a lifestyle and acknowledges that people have a specific type of relationship with their environment or occupation, which is clearly different from any other type of relationship. "Continuity" allows for the maintenance or reinforcement of identity (Twigger-Ross and Uzzell 1996). There is strong evidence to suggest that control over whether this change occurs is important for psychological and emotional well-being (Fried 2000; Twigger-Ross and Uzzell 1996). "Self-esteem" enables people to positively evaluate themselves. It is closely related to a person's feeling of worth or social value, and is associated with a sense of pride (Barnes, Hayter, and Hay 1999; Salaman 1974). "Self-efficacy", the fourth component of self-identity, is defined as a person's belief in his/her capabilities to meet situational demands or tasks (Twigger-Ross and Uzzell 1996; Tunstall 1969).

Employability: Age, Education and Attitude to Working Elsewhere (Social Dependency)

Resource users can become dependent upon a resource because they lack transferable skills that allow them to take advantage of other employment opportunities within the region. A person's age, attitude to working elsewhere, and level of education can be an indicator of his/her level of employability (Allison and Hobbs 2004; Barnes et al. 1999;

King and Hood 1999; Rickson, Western, and Burdge. 1990). People living and working in resource dependent communities typically have few transferable skills and become “locked” into their occupation as a result (Humphrey 1994; Reed 1999). This is commonly because resource users are often determined to follow career goals in their chosen areas. They leave the education system early, securing apprenticeships and taking advantage of their age and economic employability (Marsh and Williamson 2001). If jobs become scarce within the industry, however, then these people are severely disadvantaged in the employment market (Freudenburg 1992; Marsh and Williamson 2001; Rickson et al. 1988). Older resource users are especially disadvantaged since they are, “too young to retire and too bloody old to work” (Barnes et al. 1999:781). They are the least willing to relocate and begin a new career and are generally the least equipped with the necessary occupational and social skills to take advantage of other employment opportunities (Rickson et al. 1990).

Attachment to Place (Social Dependency)

The level of attachment that resource users have to their community may be an indicator of their willingness and ability to search for employment elsewhere or to diversify locally (Adger et al. 2002; Fried 2000). “Attachment to place” is a concept that describes the level of connection that individuals have with their physical community (Green 1999; Hidalgo and Hernandez 2001; Twigger-Ross and Uzzell 1996). It provides meaning to comments such as, “this is a timber town.” It describes the identity created around the township, the sense of pride associated with belonging to the town and the strong friendships and networks that exist within it (Bolton 1992; Flora 1998; Gustafson 2001; Stedman 1999). The concept provides insight into social well-being and quality of life and is a useful indicator of community sustainability (Field and Burch 1988; Force et al. 1993; Locke, Adger, and Kelly 2000; Mitchell 1974, Stedman 1999). The attachment that resource users have to their community may be an important predictor of how they might respond to a new policy and adapt (Bliss, Walkingstick, and Bailey 1998; Illo and Polo 1990; Field and Burch 1988; Force et al. 1993). People with a strong level of attachment to their community can be significantly distressed at the prospect of moving from their town or place (Fried 2000; Illo and Polo 1990; Locke et al. 2000). People will often prefer the stability associated with remaining in the one community, and this can increase their dependency on the nearby resource (Fried 1963; Stedman 1999).

Family Characteristics (Social Dependency)

Whether resource users have a family can be an important measure of how dependent they might be on a resource and how resilient they might be to institutional change. People with families are less able to experiment with their options for the future and are consequently less flexible in their approach to change (Poggie and Gersuny 1974; Sorenson and Kaye 1999). Faced with the prospect of a changing resource-relationship, resource users must consider the impact upon their families. For example, in a study of the social implications of fisheries policy change in Florida (the Florida net ban), Smith (1995) found that 45 percent of women were required to increase their time in non-fishing employment either by starting work or by adding hours to their current job. This reduced financial strain within the household but increased marital stress since the women still had to do all of the normal chores. At the same time, however, families can be sources of support during transitional times. In the farming industry, for example, Bennett (2001) found that the support of wives had important consequences for how a family responds to rural restructuring.

Business Size and Approach (Economic Dependency)

The business size and approach that resource users adopt can influence their level of dependency on the resource. Business size and approach are potential indicators of the business skills that people possess, of their competitive advantage within the resource industry and their level of transferable skills outside of the resource industry (Humphrey 1994; Nord 1994; Peluso, Humphrey, and Fortmann 1994). In agricultural areas, for example, property size is a key determinant of adaptive capacity (Abel and Langston 2001). Larger businesses can buffer themselves from unpredictable problems such as mechanical breakdowns, difficult employees and fluctuations in the weather. They can take bigger risks and experiment with their options for the future (Fisher 2001; Humphrey 1994; Peluso et al. 1994; Stedman 1999). In addition, business-owners in larger companies are more likely to have the ability to motivate, plan, organize, and act and are more likely to be driven by economic incentives to harvest the resource (Stedman 1999). The most successful resource users in terms of income are those that are more competitive in a business-sense and are better at exploiting the resource (Gramling and Freudenburg 1992; Poggie and Gersuny 1974).

Financial Status (Economic Dependency)

The financial status of resource users, defined by their level of income and level of debt, can significantly influence their level of dependency upon a resource (Fisher 2001; Freudenburg and Frickel 1994; Green 1995; Johnson and Stallman 1994; Overdeest and Green 1995). Resource users with a lower financial status lack the flexibility with which to successfully incorporate the costs of change into their working lives (Humphrey 1994; Nord 1994; Peluso et al. 1994). People with a low income are often reluctant to take on further risks (Bliss et al. 1998; Chambers 1989; Ogburn 1972). For example, Field and Burch (1988) describe how poor peasants in Asia are more likely to try new varieties of rice rather than new tree species, since rice grows relatively quickly. If a new rice crop fails, the loss is not as great as had a tree crop failed. Resource users with higher financial status are also more likely to be able to diversify.

The Level of Specialization (Environmental Dependency)

The level of specialization of resource users can influence their level of dependency upon the resource (Bliss et al. 1998; Machlis and Force 1988; Randall and Ironside 1996). Specialization often occurs as the result of capital being secured in vessels and equipment (Nord 1994). This increases the efficiency of the operation, decreases the price of the product and maintains social status (Poggie and Gersuny 1974). Resource users who target only a few species, or are reliant on a single resource, are severely restrained in their ability to be flexible and adapt to changes in the resource relationship. They are vulnerable to resource degradation and are dependent on the seasons bringing good harvests (Adger 2000; Bailey and Pomeroy 1996; Field and Burch 1988). Specialist behavior is typical of regions in which resources are predictable, and the system is regarded as “stable.” However, the “stable” system is not necessarily resilient in the face of change. Generalists or resource users that target more than one species can exhibit a more “resilient” nature since they can interchange between resource types as the need arise. Thus, in areas where resources are less predictable, a “generalist” strategy is mostly evident. For example, fishing households in Southeast Asia generally have broad sources of income and are well adapted to fluctuations in the marine and social environment (Bailey and Pomeroy 1996).

The Time Spent Harvesting (Environmental Dependency)

The time spent in harvesting a resource, either over the years or within any single year, may also be a good descriptor of the level of

dependency on a resource, since it reflects the amount of personal investment within the resource-extractive industry and the development of skills and knowledge (Carroll and Lee 1990; Cinner 2005). These factors are a measure of the level of human capital that has been developed (Wingard 2000). Human capital is the knowledge, skills, abilities, and values that individuals develop. It can be used to increase economic capital (increasing profitability and income) through the application of knowledge, skills and abilities for economic return. It can also be developed through social capital—using networks and normative processes of mutual obligation in which exchange is noneconomic (King and Hood 1999). People who spend more time harvesting the resource are expected to be more dependent on the resource than people that have additional income or have only recently entered the industry.

The Commercial Fishing Industry in Queensland

The commercial fishing industry in North Queensland provides an especially relevant case study to test and apply the concept of resource dependency as an influence on social resilience. The industry consists of trawl fishers, line fishers, crabbers, and netters, all of which are of interest in the current study. Many fishers hold a multiply-endorsed license, which means that a line fisher, for instance, may also trawl or net (Fenton and Marshall 2001). Like other fisheries around the world (Bailey 1997; Hanna 1996; McCay 1996), the industry and fisheries resource is reaching a “critical” stage where the ecological and social resilience of the system is threatened (Costanza et al. 2000; Holling and Meffe 1996a, b). The status of several fisheries stocks within Queensland are currently listed as threatened, and there is strong public pressure to further substantially reduce, if not remove altogether, commercial fishing within the Great Barrier Reef World Heritage Area (Howe 2002). Subsequently, the fishing industry has been at the center of public debate over the sustainability of its activities for many years. During this time, there have been numerous attempts to curb associated environmental impacts and ensure environmental sustainability through the implementation of policies that regulate the use of, or access to, the fisheries resource (Howe 2002; Hughey 2000). Recently, for example, under the provisions of the Fisheries Act 1994, the Fisheries (East Coast Trawl) Management Plan was developed to ensure that the trawl fishery is managed in a sustainable manner (“The Trawl Plan 2002”). Policy changes were introduced such as a license buy-back scheme, unit allocations based on previous fishing effort and

boat size, expensive penalties, gear modifications (such as turtle-exclusion devices and by-catch reduction devices), and fees for unit trade, license transfer, and the upgrading of vessels. In 2004, “The Line Plan” was implemented in which quotas of reef species caught by hand lines were significantly altered. In 2004, the “Representatives Area Programme” was implemented in which one third of the Great Barrier Reef became “shut off” to commercial fishing.

Prior to 2002, the commercial fishing industry was the eighth most valuable primary producer for Queensland and the third largest commercial fleet in Australia (Hundloe and McPhee 2002; Williams 2002). In the year 2000, for example, the Gross Value of Production (GVP) of the industry was variously valued between \$295M–330M (McPhee and Loveday 2000; Williams 2002). In 2006 the industry was only worth \$120M. The social significance of the industry to Queensland was also substantial. For the year 2000, Fenton and Marshall (2001) estimated that there were 2,444 active fishing business operators or “Masters License holders” in Queensland, with most businesses employing between two and three crew in addition to the Master Fisher. During the peak fishing season they estimated that there were 7,088 full-time equivalent employees, while in the off-peak season these numbers were reduced to approximately 6,100 employees. There are no current estimates of the numbers of commercial fishers in Queensland.

The recent increases in the total amount of “no-take” areas within the GBR Marine Park have led to strident claims of social and economic hardship, however, with large financial (\$64M in compensation) and political costs to the institutions responsible for approving and implementing the new policies. These events have brought into sharp relief the need for tools to predict social and economic consequences of policy options as a means of minimizing unwanted or unpredictable costs of policy change in this natural resource setting.

Methods

A quantitative survey was developed to assess a resource user’s level of social, economic, and environmental dependency on a resource. A scoping study was undertaken with 15 fishers and their families to ground the survey within the context of the fishing industry in North Queensland. A pilot survey was undertaken to pre-test the survey in terms of its readability, ambiguity and variability in responses. Responses were required in the form of a 4-point Likert scale, ranging from “strongly disagree” to “strongly agree.” The final version of the survey was administered to 100 commercial fishers and their families in

5 coastal communities in North Queensland, Australia: Cooktown, Port Douglas, Innisfail, Townsville, and Bowen. These communities represented a range of population sizes and fishing communities (Marshall 2006). These communities represented a span of population sizes, ranging from 1,800 for Cooktown to 91,000 for Townsville. Commercial fishers represented less than 2 percent of each community. Sampling occurred by visiting each community and contacting as many commercial fishers as possible until 100 commercial fishers had participated in the research. The surveys were voluntary and received a 100 percent response rate. Between 46–68 percent of the commercial fishing industry within each community was sampled (Marshall 2006).

A reliability analysis was used to ensure that only those statements that contributed to the internal consistency of the scale for social, economic and environmental dependencies were included (Chen and Popovich 2002; Spector 1992; Zeller and Carmines 1980). A Cronbach's alpha of 0.7 or greater was accepted as indicating a reliable scale (Nunnally 1978). Survey questions and statements were also included to measure the resilience of each commercial fisher to generic institutional change. These related to the: (i) perception of risk associated with change, (ii) perception of the ability to plan, learn, and reorganize, (iii) perception of the proximity to the threshold of coping, and (iv) level of interest in change (Marshall and Marshall 2007).

Social resilience and resource dependencies were quantified for each commercial fisher on the basis of the factor score for each scale. A factor score is a composite measure (like "mean") that reflects the relative weighting of each statement in producing the scale. Factor scores were produced using a Principal Components Analysis (PCA). A PCA is a statistical technique used to discover which statements form subsets that are relatively independent of one another. Statements that are correlated with one another but are largely independent of other responses are combined into factors (Tabachnick and Fidell 1996; Zeller and Carmines 1980). A PCA is based on the assumption that some underlying factors, which are smaller in number than the original number of statements, are responsible for the co-variation among the responses (Kim and Mueller 1978). In this study, the data are rotated using an orthogonal rotation (varimax), which simplifies the factor structure by maximizing the variance of a column in the pattern matrix (Kim and Mueller 1978).

To assess the significance of resource dependency on each of the four dimensions of social resilience, a Pearson correlation was conducted between the factor scores for each variable. A Pearson's correlation coefficient is a measure of the strength and direction of the

linear association between the independent and dependent factors. A Pearson's correlation allows an assessment of the likelihood that each independent variable is a predictor of the dependent variable. An alpha level of 0.05 was used to assess the significance of each relationship (Underwood 1997).

Qualitative interviews were undertaken during the same period as the quantitative surveys and on the same 100 respondents. The goal of this phase of the study was to gain as much information as possible on resource dependency and the likely response to generic institutional change (social resilience) so as to best describe the likely mechanisms linking the variables together. Data were also used to validate the results from the quantitative survey and to ensure that they were interpreted as accurately as possible. Interviews were semi-structured in style. Interviews usually lasted two to three hours. Detailed notes were taken during each interview. Every evening after interviews had taken place, notes were edited, modified, and additions were made as part of a "research journal" (Carroll and Lee 1990).

Interview summaries for each of the 100 participants were constructed from the research journal. Summaries highlighted the main issues that were discussed, the response to policy change, as well as notes on resource dependency. Basic demographic (e.g., age, gender, date, community, interview place, and duration), and other relevant data were also recorded from each interview summary. Data were analysed using Content Analysis. Content analysis is a powerful data reduction technique that compresses many words of text into fewer content categories on the basis of explicit rules of coding (Stemler 2001). The technique can be used to analyse the presence, meanings, and relationships of words and concepts within texts and make inferences about the messages within them (Weber 1985).

To analyze the interviews, interview summaries were summarised using keywords that were established prior to the analysis ("a priori coding"). Keywords consisted of the factors comprising each of the conceptual variables (e.g., level of attachment to the occupation, interpretation of policy change, etc.). Keywords were attributed to words, sentences, or paragraphs within each interview summary that best described how the keywords could be interpreted. Conceptual links were then made between the variables and patterns identified (Henderson 1994).

The mean age of fishers in the sample of 100 fishers was 52 years (born in 1953). On average, fishers entered the industry in their early twenties, have lived within their community for 23 years, and have a family member (such as a father, brother, uncle, or grandfather) who

also fishes. The average fisher has completed 9–10 years of formal education. About half of the fishers in the sample had completed an apprenticeship and nearly half had completed a business course. About 85 percent of fishers have worked outside of the industry, although only 30 percent believe that they could ever gain employment again in that industry if the need arose (Marshall 2006).

Seventy-six percent of fishers were married. Most wives were involved in the fishing business for at least 6 hours a week, although the average was 28 hours per week. Wives rarely joined their husbands out at sea. The average age of wives was 56 years; they had 9–10 years of formal education, and few had undertaken a short course to improve their business skills. Around 50 percent of wives had an additional income. Most had worked elsewhere and were confident of being able to earn an additional income if the need arose. Wives have spent an average of 22 years in the community in which they currently live. Nearly half of the wives had never known their husbands to be anything other than a fisher (Marshall 2006).

The average fisher was self-employed, without employees and without additional income. The average fishing business turnover was around \$101–150K per annum; fishers generally possessed one boat of around 10 meters in length and were unlikely to have any debt associated with the fishing business. Most fishers had one dependent. Net income for most families was less than \$30,000 although the average was between \$30–40,000. Most fishing families owned their own home. Most fishers targeted one seafood species on fishing trips that were typically five days long. The average fisher spends approximately 150 days out at sea each year.

Fishers generally attend at least 6 fishery meetings each year, know someone sitting on a Local Management Advisory Committee (LMAC), and know their industry representative (QSIA branch chair person) “very well.” Most fishers have never been on social welfare benefits (e.g., “the dole”).

Results

The scales developed for industry attachment, attachment to place, and employability (social dependencies) were internally consistent (Table 1). The scales to quantify business size and the financial situation (economic dependencies) could be improved since Cronbach’s alpha was low (Table 2). The scale for the level of interest in the environment, local knowledge, and harvesting skills were also internally consistent (Table 3). The scales developed to measure the level of

specialization and the time spent harvesting were based on one statement each.

The results of the Principal Components Analysis (PCA) suggested that social factors were best described by 2 components, explaining 77 percent of the variation (Table 4). The first social component is a combination of the attachment to place and family circumstances (“local influences”). The second social component is a combination of the level of employability and attachment to the occupation (“personal influences”). The economic factors were best described by 2 factors, explaining 79 percent of the variation (Table 5). The first economic component is a combination of business size and approach (“business influences”), and the second component reflects the financial situation. Environmental factors were best described by one factor, explaining 58 percent of the variation (“environmental influences”) (Table 6).

Table 7 shows that “personal influences” and “business influences” were significantly correlated with components of social resilience. Personal influences were negatively correlated with the first and third dimension of social resilience: “risk assessment,” and “proximity to the threshold of coping.” Business influences were positively correlated with the second and third dimensions of social resilience: “the ability to plan and reorganize” and “proximity to the threshold of coping.” “Local influences,” “the financial situation,” and “environmental influences” were not significantly correlated with any dimension of social resilience.

Qualitative Results

Level of attachment to the fishing occupation. Most fishers in this study were deeply attached to the notion of being a fisher. Fishing offered a lifestyle that was extraordinary and, for many, completely consuming. Many fishers also felt that fishing was an occupation at which they were particularly accomplished. Fishing allowed many to demonstrate their competence in a challenging and unique workplace. For example, some described working on board in rough weather, working at nighttime, and how they had to be, for example, “a plumber, an engineer, a doctor, a cook, and a priest.” Others described the skill involved in finding and catching fish and/or prawns and dealing with the constant daily challenges that plagued sea-going machinery. Overall, fishers took enormous pride in being independent. They were free from regimentation and could work outdoors. Where there was excessive attachment to the industry, fishers were unwilling to consider

Table 1. Descriptive Statistics and Reliability Analysis for the Scale for "Social Dependency"

| Survey Items | Mean | SD | Item-Total Correlation | α if Item Deleted |
|--|-------|-------|------------------------|--------------------------|
| <i>Level of Industry Attachment ($\alpha=0.700$)</i> | | | | |
| I can't think of another job I would rather do | 3.586 | .659 | .570 | .622 |
| I would find it very difficult working for somebody else | 3.280 | .923 | .926 | .739 |
| Being independent is the best thing about being a fisher | 3.587 | .659 | .468 | .651 |
| I prefer being out to sea than on land | 2.800 | .944 | .466 | .651 |
| I like being a fisher | 3.720 | .534 | .606 | .629 |
| The fishing industry to me is a lifestyle—it is not just my job | 3.520 | .794 | .417 | .664 |
| <i>Attachment to Place ($\alpha=0.852$ if item deleted)</i> | | | | |
| I feel like I belong to this community/town | 3.425 | .759 | .520 | .284 |
| I am proud to tell people in my town that I am a fisher | 3.362 | .860 | .198 | .367 |
| I plan to be a resident of this town for a number of years | 3.500 | .746 | .615 | .260 |
| I have some very strong friendships in this town | 3.375 | .752 | .465 | .300 |
| The friendships I have in this town mean a lot to me | 3.412 | .723 | .434 | .313 |
| If I needed advice I could go to someone in my community | 3.025 | .899 | .272 | .342 |
| <i>Employability ($\alpha=0.723$)</i> | | | | |
| What is your highest level of education?*** | 3.698 | 1.495 | .295 | .753 |
| Have you done any courses to improve your business?*** | 1.397 | .492 | .186 | .736 |
| Could you easily get a job in this area again?*** | 1.253 | .437 | .586 | .705 |
| It is a waste of my skills to get a job outside of the industry* | 1.891 | 1.036 | .350 | .718 |
| I have many options if I decide to no longer be a fisherman | 1.590 | .897 | .644 | .668 |
| I am too young to retire, & too old to find work elsewhere* | 1.650 | .889 | .349 | .717 |
| Our skills would be useful in setting up a business other than in fishing | 2.313 | 1.046 | .321 | .724 |
| We would be nervous trying something else* | 1.819 | .925 | .634 | .668 |
| I am confident that I could quickly gain work outside of the fishing industry if I needed to | 1.879 | 1.654 | .600 | .671 |
| <i>Family Attitude to Change ($\alpha=0.701$)</i> | | | | |
| (Spouse) I cannot imagine my spouse working for someone else | 3.611 | .684 | .107 | .709 |
| (Spouse) We are more likely to cope with changes compared to other families we know | 2.666 | .990 | -.091 | .749 |
| (Spouse) I would love to see my spouse get a profession other than fishing | 1.833 | 1.023 | -.290 | .780 |

Table 1, Continued

| Survey Items | Mean | SD | Item-Total Correlation | α if Item Deleted |
|---|-------|-------|---------------------------|-----------------------------|
| (Spouse) I believe that the future will look after itself | 1.574 | .815 | -.049 | .732 |
| (Spouse) I feel like I belong to this town/community | 3.481 | .884 | .445 | .665 |
| (Spouse) I often socialize with people in my town/community | 3.518 | .574 | .583 | .660 |
| (Spouse) I have many family/friends within an hours drive of this town/community | 3.370 | .937 | .653 | .628 |
| (Spouse) I have some very strong friendships in this town/community | 3.444 | .793 | .760 | .620 |
| (Spouse) The friendships that I have with people in this town mean a lot to me | 3.500 | .720 | .730 | .631 |
| (Spouse) It is important for me to know how other fishing families are coping | 3.203 | .786 | .538 | .654 |
| (Spouse) I look towards my friends in the industry for support during difficult times | 2.703 | 1.002 | .548 | .645 |
| (Spouse) If I needed some advice I could go to someone in my community | 3.166 | .905 | .614 | .636 |

Notes: The mean and standard deviation for each statement within each scale was based on a 4-point scale ranging from 1=strongly disagree, 2=disagree, 3=agree to 4=strongly agree unless otherwise specified.

* The data for negative worded statements were reversed prior to analysis

** Measured on a 6 point scale ranging from year 7 to year 12

*** Measured on a 2-point scale (1=no and 2=yes)

Table 2. Descriptive Statistics and Reliability Analysis for the Scale for "Economic Dependency"

| Survey Items | Mean | SD | Item-total Correlation | α if Item Deleted |
|--|--------|-------|------------------------|--------------------------|
| <i>Size of Business ($\alpha = 0.619$)</i> | | | | |
| How many people (outside of family) did you employ over the last 12 months? | 3.971 | 8.649 | .463 | .525 |
| Approximately, how much income does your business turn over each year?*** | 3.471 | 2.048 | .584 | .383 |
| How many fishing boats do you have? | 1.671 | .958 | .227 | .535 |
| How big is each fishing boat (m)? | 11.305 | 4.104 | .465 | .302 |
| <i>Business Approach ($\alpha = 0.710$)</i> | | | | |
| Every time there is a new change in the industry, I plan a way to make it work | 2.878 | .950 | .316 | .666 |
| I feel uncomfortable making decisions without information about changes | 3.554 | .761 | .034 | .691 |
| I always know how much money is coming in and out of my business | 2.945 | 1.032 | .194 | .679 |
| I always share my business concerns with my spouse | 3.621 | .589 | .254 | .675 |
| I tend to ignore proposed changes and wait to deal with them later * | 2.986 | 1.040 | .027 | .698 |
| I am always thinking of new and better ways to improve my fishing business | 3.770 | 2.485 | .283 | .708 |
| We always get professional advice before making a business decision | 2.662 | 1.125 | .418 | .651 |
| We can never guess how much money our business will make each month | 3.297 | .902 | .428 | .655 |
| We have a detailed business plan for the following year | 2.202 | 1.110 | .521 | .638 |
| We have a 5-year business plan | 1.891 | 1.054 | .487 | .644 |
| Our business is growing slowly into something bigger | 2.337 | .969 | .250 | .673 |
| Our skills would be useful in setting up a business other than in fishing | 2.270 | 1.050 | .275 | .670 |
| We often talk about the state of our business with a business professional | 2.743 | 1.034 | .504 | .642 |
| We would be nervous trying something else** | 1.729 | .848 | .237 | .674 |
| I am always interested in learning new ways to improve my business skills | 3.013 | .957 | .449 | .651 |
| <i>Financial Situation ($\alpha = .633$)</i> | | | | |
| How much business debt do you have left to pay off?*** | 2.076 | 1.228 | .159 | .259 |
| What proportion of your households income comes from fishing?***** | 4.307 | 1.044 | .269 | .200 |
| How much income from the fishing industry do you take home each year?***** | 2.446 | 1.723 | -.015 | .425 |
| Do you own, rent or are paying off your home?***** | 1.646 | .738 | .140 | .282 |
| We always have an amount to cash available for emergencies | 2.707 | 1.085 | -.142 | .423 |

Table 2, Continued

| Survey Items | Mean | SD | Item-total Correlation | α if Item Deleted |
|--|-------|-------|---------------------------|-----------------------------|
| Our house will probably have to be sold if our fishing business fails* | 2.415 | 1.210 | .405 | .082 |
| Fluctuations in the market-price of our fish product significantly * | 3.169 | .977 | .257 | .213 |

Notes: * The data for negative worded statements were reversed prior to analysis

** Measured on a 7-point scale ranging from \$0–50K to >\$350K

*** Measured on a 4 point scale ranging from \$0–10, \$11–40K, \$41–100K, >\$101K

***** Measured on a 5-point scale ranging from <20% to >80%

***** Measured on a 6-point scale ranging from \$0–30K, \$31–40K, \$41–50K, \$51–60K, \$61–70K, >\$71K

***** Measured on a 3-point scale ranging from 1 = own home, 2 = mortgage, 3 = rent

Table 3. Descriptive Statistics and Reliability Analysis for the Scale for "Environmental Dependency"

| Survey Items | Mean | SD | Item-total Correlation | α if Item Deleted |
|--|-------|-------|---------------------------|-----------------------------|
| <i>Level of Specialization</i> | | | | |
| What are the main species that you fish for? (number of species) | 3.8 | 2.65 | . | . |
| <i>Time Spent Harvesting</i> | | | | |
| How many day/ nights were you fishing over the previous year? | 152.7 | 69.93 | . | . |
| <i>Interest in the Environment, Local Knowledge & Harvesting Skills ($\alpha = .709$)</i> | | | | |
| I prefer being out at sea than on land | 2.795 | .933 | .302 | .624 |
| Big companies will be the only ones to survive future changes in the industry | 3.337 | .859 | .191 | .640 |
| I like to think of myself as 'environmentally sensitive' | 3.626 | .675 | .166 | .642 |
| There are too many fishers in the fishing industry here in QLD | 2.975 | .923 | .348 | .617 |
| I am concerned about the level of illegal (commercial) fishing that is occurring | 2.879 | 1.097 | .388 | .608 |
| I would like to learn about 'sustainability of the fisheries resource' | 3.228 | .770 | .252 | .632 |
| The technology within the industry means that anyone can be a skilful fisher | 2.108 | .962 | .045 | .663 |
| I would like to spend more time fishing | 2.710 | .969 | .346 | .617 |
| I have some good ideas about how to ensure the sustainability of my species | 3.433 | .647 | .482 | .608 |
| For safety reasons, I prefer to work with other boats around, whilst out at sea | 2.096 | .932 | .075 | .658 |
| I would be good at teaching younger people about the marine environment | 2.927 | .997 | .301 | .624 |
| There are too many other fishers working in the areas that I fish | 3.313 | .679 | .078 | .651 |
| I am confident that my skills will mean that I am successful in the industry | 3.120 | .787 | .342 | .620 |
| A good fisherman knows a lot about the biology of their main species | 3.277 | .703 | .302 | .627 |
| I am always learning about the ecology of the marine environment | 3.325 | .827 | .366 | .616 |
| My life seems to be ruled by the weather | 3.373 | .851 | .172 | .643 |
| I am proud to tell people in my town that I am a fisher | 2.795 | .933 | .302 | .624 |

Table 4. Principal Component Analysis on the Social Component of Resource Dependency

| Categories of Social Statements | PC 1 55.56 Percent “Local Influences” | PC 2 21.27 Percent “Personal Influences” |
|---------------------------------|---|--|
| Attachment to place | .934 | |
| Family attitude | .811 | |
| Employability | | -.933 |
| Attachment to occupation | | .786 |

Notes: Values less than .4 are not shown

alternative forms of employment. They found it extremely difficult to imagine a life outside of the industry and were apathetic to making suggestions. The more firmly attached an individual was to his/her occupational identity, the more traumatic the potential loss of his/her livelihood appeared to be.

Employability. A great many commercial fishers in this study were older, had few transferable skills, and were worried about securing work elsewhere. These fishers were acutely aware of their limitations within the labor market. Many were close to retiring but were not quite financially, mentally, or physically prepared. Younger fishers were generally more confident of their ability to fall back upon a trade or to secure alternative employment, however many younger fishers were also aware of their relatively low level of education. Older fishers believed that they would have to significantly reduce their standard of living in the event of policy change affecting their access to the fisheries resource. Many fishers were ineligible to receive welfare benefits and were too young to access their superannuation or the old-age pension.

Family circumstances and attitudes. Families could be extremely supportive during uncertain times and assist in increasing the husband’s competitiveness within the industry. Many women were involved in the running of the fishing business from “doing” the books to employing crew, organizing the boats when they were in port

Table 5. Principal Component Analysis on the Economic Component of Resource Dependency

| Categories of Economic Statements | PC 1 45.82 Percent “Business Influences” | PC 2 33.65 Percent “Financial Situation” |
|-----------------------------------|--|--|
| Business size | .830 | |
| Business approach | .828 | |
| Financial situation | | .993 |

Notes: Values less than .4 are not shown

Table 6. Principal Component Analysis on the Environmental Component of Resource Dependency

| Categories of Environmental Statements | PC 1 58.21 Percent |
|--|-----------------------|
| No. of species targeted | .695 |
| No. of days/nights spent fishing | .676 |
| Environmental interest/skills | .559 |

Notes: Values less than .4 are not shown

(cleaning, processing the seafood, and restocking with supplies), and keeping up-to-date with changes in fisheries legislation. However, when times were financially difficult, women were regarded as better able to secure alternative income. This meant that either: (i) the business had to do without her help, or (ii) she was required to complete her normal tasks in addition to her paid job. Marital stress, resulting from financial strain, as the result of institutional change was the most significant concern for fishers with families. In addition, fishers were often unwilling to consider moving elsewhere to increase their employment opportunities because they were aware of their family's attachment to the community.

Community attachment. Many fishers were relatively well-established within their communities. For most fishers, however, community attachment was not necessarily an attachment to the place itself, but rather an expression of the opportunity to spend time with children and grandchildren. In these instances, community attachment acted to reduce the flexibility that fishers had to pursue employment opportunities elsewhere. Divorced fishers believed that if they left their

Table 7. Results of the Pearson Correlation Matrix

| | FS1: Risk | FS2: Planning | FS3: Coping | FS4: Interest |
|---|-----------|---------------|-------------|---------------|
| Social | | | | |
| Local (place, family) | -.116 | .133 | -.016 | .071 |
| Personal (employability, occupational attachment) | -.678** | -.106 | -.340* | -.073 |
| Economic | | | | |
| Business (size & approach) | .250 | .436** | .309* | .083 |
| Financial situation | .194 | .130 | .121 | .104 |
| Environmental | | | | |
| Specialisation, time, interest | .032 | .057 | .034 | .055 |

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

FS=factor score derived from PCA combining similar survey responses

Note: Significant correlations are highlighted by asterisks.

community, it would be nearly impossible to spend time with their children, especially if the relationship with the mother was on “bad terms.” Fishers that did not have a family, however, appeared to be much more willing to move from their community to take advantage of employment opportunities elsewhere.

Economic factors. Most of the fishing businesses in this study were small family-based businesses with very few employees, if any. Only a small number of fishing businesses in this study were large-scale enterprises employing large numbers of crew. Some smaller-scale fishers were very relaxed in their financial expectations whereas others were driven to maximize their profits. Smaller-scale fishers believed that they did not have the necessary financial buffer or necessary skills to develop their business and survive future policy change. Many preferred to spend time in endeavors that they were familiar with, such as fishing and maintaining gear rather than investing in the strategic development of their business. Some smaller-scale fishers had never entered into debt because, although they realized it might be a way to “get ahead” they were unwilling to increase their level of financial vulnerability. These fishers realized that they were unable to compete with the confidence, knowledge, and skills of larger-scale fishers.

Environmental factors. For many fishers the time spent at sea developing knowledge and skills has fostered a genuine interest in the marine environment. Qualitative results suggested that fishers that had an avid interest in issues of sustainability were more likely to be aware of the need to implement strategies to better protect the sustainability of the resource. Some fishers clearly took pride in their knowledge of the ecology, biology, and oceanography of the local area, whereas others did not believe it was necessary to know much more than “how to fish” in order to be successful within the industry. Fishers with a higher personal investment in the industry, as determined by their level of skill and local knowledge, were more dependent on the fisheries resource because they felt that they had “more to lose.” Either way, skill was a tremendously important aspect of the relationship with the environment. It encompassed cumulative knowledge of the environment and sometimes reflected a tradition of practice devoted to the development of skills. However, many fishers were worried about their ability to catch fish in the future because of over-harvesting by other commercial fishers. In particular, smaller operators were concerned that the bigger companies, well-endowed with superior technology, would become superior competitors and could continue fishing regardless of “normal” environmental protectors such as the weather and mechanical breakdowns.

Discussion of Results

Resource users can be dependent upon a resource for its many social, economic and environmental benefits. This study suggests that three of the four components of social resilience (identified by Marshall and Marshall 2006) can be influenced by social and economic dimensions of resource dependency. A high level of social (employability and attachment to the occupation) and economic (size and approach) dependency hindered the ability of commercial fishers in this study to positively assess their ability to cope with change (the first component of social resilience). A high level of social dependency was correlated with a negative assessment of the level of risk associated with change (the second component of social resilience). A high level of economic dependency was correlated with a negative ability to plan and reorganize (the third component of social resilience).

The results of this study provide a framework for refining our understanding of how resource-dependent users respond and adapt to institutional change. Resource users that are socially and economically dependent upon the resource are vulnerable to institutional change because they lack the necessary skills, attitude, and opportunities to successfully navigate through a policy change period. Resource dependency acts to reduce the flexibility with which resource users can approach, and adapt to, change. Many fishers have developed a niche within society, which, for most of their lives, has provided stability and security. Faced with changing institutional, social, and environmental conditions, however, many have become vulnerable. Fishers who are unprepared for change and highly dependent on the fisheries resource are severely constrained in their capacity to be resilient. These fishers are unable to experiment with their options for the future and are less likely to take risks. They are unlikely to successfully transform outside of the industry, and they are unlikely to remain viable within the industry.

The assessment of risk that people make in approaching change (the first component of social resilience) is of fundamental importance in describing the likely resilience to future change. It is related to the level of confidence that resource users might have in themselves and in the future. Fishers who are confident that they are able to incorporate the requirements of change into their lives are more likely to assess the risk associated with policy change more positively. Confidence provides an indication of the level of self-assurance arising from an appreciation of one's abilities. The erosion of confidence can affect the decisions that people make about the future, and the ways in which they are made, and this in turn can alter people's views of themselves and affect their

ability to be resilient (Freudenburg 1992; Gramling and Freudenburg 1992). Resource users with a high attachment to their industry and a low perception of their employability are unlikely to assess the risk associated with change positively.

The perception of the ability to plan and reorganize as a response to institutional change is the second dimension of resilience observed in this study to be significantly affected by resource dependency. It was apparent that some fishers are better able to plan for and adapt to change than others. Fishers with a stronger “business” approach are more likely to show these attributes compared to fishers that have a “lifestyle” approach. Other researchers have also found that adaptation processes do not occur unless people use novelty, creativity, experimentation, learning, and planning in approaching change (Folke et al. 2005; Hiedanpaa 2005; Olsson, Folke, and Hahn 2004). Harris and McLaughlin (1998), for example, studied 387 timber-dependent communities in the interior Columbia Basin (Pacific Northwest). They found that communities that were more likely to be resilient possessed characteristics that reflected their ability to plan and reorganize and had a greater “preparedness for the future.” Results from this research also suggest that these qualities can predict resilience at an individual level within the commercial fishing industry.

Social and economic resource dependency significantly affected a third dimension of social resilience: the perceived ability to cope. This dimension self-describes the proximity to the thresholds of coping (Marshall and Marshall 2007; Walker and Meyers 2004). In this study, thresholds of coping are described by the level of stress related to financial, emotional, and psychological factors. Stress, as measured by those experiencing the event, can be a significant response to policy change (Bradley and Grainger 2004; Smith 1995; Smith et al. 2003; Sonn and Fisher 1998). This study has shown that resource users are more likely to experience stress affecting their ability to be resilient if they have low employability and high occupational attachment, as well as if they have only a small fishing business and few business skills.

Social dependency can affect resilience in several ways that are best described using qualitative data. Fishers who become excessively attached to the industry, for example, become vulnerable to institutional change. Some fishers in this study were exceptionally attached to the industry. Other researchers have observed that fishers can become especially attached to their occupation, more so than in many other resource industries. In contrasting the attitudes of fishers with mill-workers in reference to the level of attachment to their respective industries, for example, Poggie and Gersuny (1974) found

that while mill workers worry more about “losing their wives than about losing their jobs,” fishermen tend to worry more about “losing their boats than losing their wives.” Fishers in this study were attracted to the fishing industry because of the opportunity to work without regimentation and to be free from the influence of others. This attraction may be one of the industry’s greatest strengths, enabling people to withstand and thrive within the unconventional and challenging work environment of the commercial fishing industry to provide seafood to the broader community. However, in the face of environmental, social, and institutional change, this quality is perhaps also one of their greatest weaknesses.

Economic dependency can affect resilience in other ways. For example, smaller-scale fishers could improve their financial situation by borrowing money to invest in and expand the earning potential of their business. However, qualitative results suggest that many smaller fishers are not interested in any further financial investment. While borrowing money to invest in a business may increase earnings, the associated debt can increase the sense of financial vulnerability. This can be a particularly strong disincentive for people who prefer to remain independent of debt. As Chambers (1989) observes, refusing to increase vulnerability by taking out a business loan enables smaller-scale fishers to ensure security and independence in the best way they can. Although smaller-scale fishing families may not be planning a plentiful future for themselves, they are mostly satisfied with their life choices, where their aspirations are oriented elsewhere than financial rewards (such as lifestyle, independence, and self-respect [Chambers 1989]). Several other researchers working in resource-dependent communities have also shown that some people prefer independence in their working lives over the opportunity for higher income (Bliss et al. 1998; Daniel 1988; Lane and Rickson 1997). This knowledge suggests that resource-protection policies requiring resource users to increase their financial investment in their business are likely to significantly erode the resilience of the smaller-scale fishers in particular.

A single resource-protection policy is unlikely to “fit all.” Other influences are also likely to be important in maintaining social resilience. For example, the way in which resource users perceive policy change can significantly influence the response to change. Marshall (2007) assessed policy perception by asking commercial fishers about their level of involvement in the policy decision-making process, how they interpret policy change (for equity, socioeconomic impacts, and conservation effectiveness) and for their perception of the rate of implementation. The study found that a negative perception of

policy change can significantly and adversely influence the behavior and emotional response of resource users which, in turn, can influence their resilience. For policy perception to be positive and resilience to be enhanced, resource users need to be meaningfully involved in the decision-making process, change needs to be implemented at an appropriate rate, and effort is required to ensure that equity, anticipated impacts, and conservation effectiveness are positively interpreted.

Furthermore, the commercial fishing industry is represented by a diversity of people with varying and complex relationships with the fisheries resource and, subsequently, varying and complex vulnerabilities. For instance, within the fishing industry, there are older people, people with little education, people with families, divorcees, people with grandchildren, people with limited business acumen, and people who have no interest in working elsewhere. Resource-protection strategies that are aimed to change the way in which these people interact with the fisheries resource need to be flexible, not overly complicated, and delivered with assistance. For example, many of these people will require assistance to develop the necessary skills to remain viable within the industry or to successfully transform elsewhere (Folke et al. 2002; Folke and Gunderson 2002; Gunderson et al. 2002). Many may require financial assistance to assist with “upgrades” or to enter another industry. Resource users who are prepared for change and are assisted through the transition process will be able to successfully incorporate the requirements of policy change into their working lives and be resilient. Compliance to the institutional change may be increased and conflict surrounding the implementation of the change may be decreased. In these ways, the social and environmental outcomes associated with natural resource management might be enhanced.

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