

# *Testing Cognitive Ethnography: Mixed-Methods in Developing Indicators of Well-Being in Fishing Communities*

**Benjamin Blount, Steven Jacob, Priscilla Weeks, and Michael Jepson**

Research was initiated in 2008 with the objective of developing social indicators for well-being of fishing communities. Initial steps included development and testing indicators for the concepts of dependence, gentrification, vulnerability, and resiliency in relation to nine fishing communities on the Texas Gulf Coast. Procedurally, a mixed methods design was employed, using quantitative analyses of large secondary data sets to rank coastal communities based on socioeconomic measures, and independently employing qualitative approaches to provide rankings of the nine communities. The two qualitative approaches, an informed expert description of the communities, and cognitive-based interviews in the same communities each produced rankings almost identical with each other and with the quantitative rankings. Three types of analyses yielded similar results, indicating that cognitive ethnography can be a valuable tool in the description of community resilience, vulnerability, and well-being.

**Key words:** cognitive ethnography, mixed-methods research, social indicators, well-being, Gulf Coast

## **Introduction**

**M**arine fishery resources in the United States are managed by eight regional fishery management councils under their parent organization, the National Oceanic and Atmospheric Administration National Marine Fisheries. The legal requirements are specified in the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) of 1996, reauthorized in 2007 (United States Department of Commerce 1996). The Act contains ten National

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*Benjamin Blount has been the owner of SocioEcological Informatics since 2008. His research focuses on the construction of cultural cognitive models among fishers on the South Atlantic and the Gulf of Mexico coasts of the United States. Steve Jacob is a professor of sociology and co-director of the Center for Community Engagement at York College of Pennsylvania. His research interest includes fishing communities, social indicators, social impact assessment, and well-being. Priscilla Weeks is an environmental anthropologist and a senior research scientist at the Houston Advanced Research Center (HARC). She served on the Socioeconomics Scientific and Statistical Committee (SSC) of the Gulf of Mexico Fishery Management Council. Her current research is on catch and release of fish in Texas waters. Michael Jepson is an anthropologist and social scientist with NOAA Fisheries' Southeast Regional Office in St. Petersburg since 2009. His research has been on fishing communities in the South Atlantic and Gulf regions of the United States. Currently, he is a member of the Gulf Council's Socioeconomic Scientific and Statistical Committee. Research for the current paper was funded by NOAA National Marine Fisheries Service: Saltonstall-Kennedy Competitive Grant Program (NA08NMF427041). The award was to the Gulf and South Atlantic Fisheries Foundation, Inc., Tampa.*

Standards that apply to specific issues in the management process. National Standard 8 addresses requirements that relate to fishing communities, specifically that management efforts affect not only the individual harvester or processor but related businesses such as boatyards, ice suppliers, and tackle shops. Any change in a fishery management plan, or the implementation of a new plan, requires that social and economic impacts on fishery-dependent communities be taken into account.

Implementation of the requirement specified in National Standard 8 has proven difficult to accomplish. Fishery anthropologists tend to respond to National Standard 8 with proposals for ethnographic research and the development of community profiles. Adequate profiles, however, require in-depth ethnography, which is extraordinarily expensive time-wise for fishery management purposes. NOAA and fishery management councils simply cannot wait for extensive ethnographies to be completed, even given a sufficient number of anthropologists to conduct the research. Fishery-dependent communities in the United States number in the thousands. A pressing need arose soon after the passage of MSFCMA for timely and accurate procedures to document social and economic impacts on fishing communities.

The authors began a series of research projects, the first one in 2008, to directly address that need. The objective was to develop social indicators of well-being for fishing communities on the South Atlantic and the Gulf of Mexico coasts of the United States. Toward that end, research was carried out to develop and test indicators for the concepts of dependence,

gentrification, vulnerability, and resiliency in relation to nine fishing communities on the Texas Gulf Coast. The results of the project are presented here, focusing in particular on the place and role of cognitive-based ethnography.

### **Core Concepts: Social Indicators, Resilience, Vulnerability, Well-being**

Social indicators are proxies for the concepts of interest in fishing communities, based on rank position in established indices and substituting for social and economic impacts of fishery management plans. Fishery dependence is a measure of a community's economic dependence on fisheries in relation to other income and livelihood bases in a community. Gentrification refers to socioeconomic change within a community due to demographic shifts toward a larger percentage of more affluent residents. Gentrification typically impacts fishing communities negatively, forcing fishers and fishing related businesses away from the coastal area through increases in land value and taxation. Although those two concepts were included in the 2008 project, they will not be discussed further in the present account. The discussion, instead, will focus on the concepts of resilience and vulnerability and those, in turn, to the more inclusive concept of well-being.

Reduced to essentials, resilience refers to the response capacity of a system to a perturbation that alters its state. The concept of resilience was initially developed in engineering, but it has been extended to ecological systems (Holling 1973) and developed into a broad and comprehensive theory, primarily through the work of Gunderson (2000) and associates (Gunderson and Holling 2002; Gunderson 2002). The social sciences borrowed the concept from ecosystem ecology, leading to increased complexity and methodological demands. Within social systems, resilience is subject to questions not only about what the outcomes are but who the recipients are when restored conditions resemble pre-altered states, in what ways, and to what degree (Abel, Cummings, and Anderies 2007). During the last decade, the concept has been subjected to intensive inquiry as refinements have been attempted, conceptually and methodologically (Adger 2000).

The approach used in the 2008 project adhered more closely to the concept as it was used in ecosystem studies, using the concept to refer generically to a capacity to withstand destabilizing inputs without undergoing a radical shift in state. The concept of vulnerability was used in a similar way, as the opposite of resilience. Vulnerability was the lack of an ability or capacity to withstand destabilizing changes (Buckle, March, and Smale 2001; Turner, Kasperson, Matson, McCarthy, Corell, and Christensen 2003). While we were aware of refinements to both concepts, we were not attempting to measure them in precise ways, which would have required a fully developed ethnography. Our objectives were to identify and standardize indicators of their potential and capacity within communities. The concept of well-being is broader and more inclusive than the other core concepts in the project, encompassing psychological, social, and

economic variables. A large literature exists (Andrews and Withey 1974; Diener, Oishi, and Lucas 2003; Kassin 2006 Miller 1991; Rossi and Gilmartin 1980; Stutzer 2004). Well-being was conceptualized in this project at a community scale. Communities identified as having higher resilience and lower vulnerability as compared with the base of 122 communities were considered to have higher well-being than communities with opposite scores, low resilience, and high vulnerability.

Procedurally, a mixed methods design was employed, using quantitative analyses of large, secondary data sets to rank coastal communities based on socioeconomic measures, and independently employing qualitative approaches. Two qualitative approaches were used: (1) an expert description of selected coastal fishing communities, and (2) cognitive-based interviews in the same communities.

Quantitative analyses of large, secondary databases and creation of indices for fishery-dependent communities are more timely and efficient than profiles established through intensive ethnography. However, secondary data sets are typically two or more years out-of-date, and the value of social indicators becomes more limited the older the databases are. Selective ethnographic inquiry can serve as a corrective measure, providing contemporary, up-to-date information about communities. Testing of the quantitative results was central to the 2008 project, which was to identify and test the validity of the quantitative outcomes. The mixed-methods design was developed in order to do precisely the same thing, to confirm the quantitative outcomes. The qualitative analyses each independently ranked the communities in terms of resilience and vulnerability, and the rankings of each of the three methods were compared. The levels of agreement were sufficiently high to confirm the validity of the quantitatively developed indicators.

Once the quantitatively derived social indicators were validated, they could be used more broadly to measure socioeconomic conditions in other coastal fishing communities. In fact, once the indicators were established, they could be applied not only to fishing communities on the South Atlantic and Gulf coasts of the United States; they have also been extended to the Northeast region of the United States and include over 2,900 coastal communities (Jepson and Colburn 2013; NOAA 2014). This paper reports on the initial research projects, assessing the validity of cognitive ethnography in comparison as measured against the quantitative outcomes.

The results of the research project can be found in the report by the Gulf and South Atlantic Fishery Foundation (2010), the supervisory agency for the research. The quantitative analyses and their qualitative tests using expert description have appeared in two publications to date (Jacob et al. 2010, 2013). The second of the qualitative methods, cognition ethnography, was not included in those publications, primarily due to space limitations. In this paper, we focus on the methods and results of the cognitive ethnography method, and we reverse the equation, using the quantitative results to test the validity of the outcomes derived from the ethnography. While the confluence of the results of the three methods is already

known, the aim here is to report in detail about the emergence of cultural models from the cognitive-based interviews in the nine communities and thus to illustrate the utility of that method. Two aspects of cognitive ethnography make it an especially valuable methodology. The ethnography builds on local terminology, and given its focus on domains, short-term or rapid-assessment ethnography can be domain specific.

### **Toward Cognitive Ethnography**

The life-blood of sociocultural anthropology has always been ethnography. The ways in which ethnography has been conducted, however, have changed through time, and a shift to cognitive-based ethnography is one manifestation of the need for changes. For much of its 125-year history, ethnography consisted of a combination of participation, observations, and interviews with residents of a given community, often facilitated by temporary presence or residence within the community. Much contemporary ethnography follows the same format and procedures. New developments, however, began in the 1960s and continue to be expanded and utilized in the present. These approaches provided ethnographers with additional tools and methods derived from and inspired by descriptive linguistics (Conklin 1962; Frake 1962, 1964; Goodenough 1956). The methods led to a more in-depth focus on selected topics and a concomitant narrowing of the scope of ethnographic research projects. Central position was given to the terms, which community members use to embed and express their knowledge. Typically in ethnography, information is obtained from local residents and then translated into terminology of the anthropologist. The aim of the new development was to begin inquiry by focusing on the lexical items used by members to refer to and organize information in their own cultural ways. Over the course of a decade, a number of significant publications appeared (Kay and Berlin 1969; Romney and D'Andrade 1964). Consistent with prior anthropological interests, much of the lexically-based research focused on the domains of kinship and color, but they soon expanded to a much wider variety of local and indigenous knowledge.

Lexical semantics morphed into an expanded cognitive anthropology beginning in the 1970s (Agar 1990; Berlin 1992; D'Andrade 1995; Dougherty 1985; Spradley 1979, 1980; Tyler 1969). An important development was the initiation of cultural models constituting an expansion of local knowledge systems into new, more abstract and complex domains (Blount 2007, 2011; Blount and Kitner 2007; D'Andrade and Strauss 1992; Holland and Quinn 1987; Kempton, Boster, and Hartley 1995; Kronenfeld 2008; Paolisso, Weeks, and Packard 2013; Quinn 2005; Strauss and Quinn 1997). These studies have shown that members of social groups hold information in common, organize the information into models, and utilize the models as a shared and mutually understood structure in their communications with one another. These cognitive models, based on specific units of information, allow for the possibility of ethnographic

inquiry to be more directly engaged in testing ideas, or hypotheses, and thus more rigorous in design (Blount 2011; Johnson 1990). The fulcrum of analysis is lexical items, as elaborated further below in the account of keywords.

### **Community Selection and Inclusion in the Data Set**

A workshop was held at the Houston Advanced Research Center (HARC) on June 15-16, 2008, to plan the social indicators research, to select the communities to be included in the project, and to begin to develop the ethnographic component. Nine communities were chosen, but one of the workshop results was the decision to expand the quantitative analyses to include a larger number of communities. In order to have a sample to provide sufficient variation in the data for reliable index development, necessary for social indicators, it was decided to include in the quantitative part of the project all communities in the county and adjacent counties to the nine primary study sites. This resulted in a data set with 122 different communities.

The nine communities chosen for inclusion in the overall study were all on estuaries along the Texas Gulf coast. There were two groupings of communities. One group was on or near Galveston Bay, and all were in the greater Houston-Galveston metroplex and were thus semi-urban. The communities were: Seabrook, San Leon, Galveston, Texas City, and Bacliff. Although all of those communities were semi-urban, they differed in terms of size, with Galveston by far the largest. Commercial fishing was economically important in all of the communities, but it did not dominate the local economy.

Further along the Texas coast and on or near San Antonio Bay or Matagorda Bay, were the communities Port Lavaca, Sea Drift, Port O'Connor, and Palacios. Unlike Galveston Bay, these communities were not semi-urban, and in fact, all but Port Lavaca had 5,000 people or less. Also, fishing was more dominant in the local economies. Only Port Lavaca had an economy that could be considered to be diversified.

### **Qualitative Results—Community Profiles**

One of the two qualitatively derived vulnerability measures and rankings was carried out by establishing brief "thumb-nail" profiles of each of the nine communities. Relying on ethnographic and socioeconomic knowledge of the communities, Weeks and Blount described each community in terms of the most salient features characterizing them. The investigators also have several decades, collectively, of research on fishing communities, and Weeks is a long-term resident of the greater Houston-Galveston complex. The knowledge of the communities can be said to be experientially- and expertly-based. The descriptions of the communities have been reported in the literature (Jacobs et al. 2010, 2013) and need not be elaborated here. The present concern is that the descriptions provided rankings of community

**Table 1. Number of Interviews Completed in the Coastal Communities**

Community	Completed Interviews
Port Lavaca	17
Seadrift	20
Palacios	13
Port O'Connor	20
TOTAL	70

vulnerability that could be compared with the results of the quantitative analyses and, in part, with the findings from cognitive ethnography.

### **Qualitative Results—Cognitive Ethnographic Interviews**

The second part of the qualitative results is more involved than the brief profiles, involving the development of a questionnaire survey, interviews with individuals in each of the nine communities, coding of the interviews, tabulating results, and deriving resilience and vulnerability measures and rankings. Each step is described below.

An interview protocol was developed by the HARC Post-doctoral Fellow in Human Natural Systems, Lovette Miller, under Dr. Weeks' guidance and modified and refined with Blount's guidance at the HARC workshop in 2008. Blount coordinated the changes and oversaw the final draft of the protocol. The final copy was a semi-structured interview protocol, containing 16 open-ended questions. The objective was for the interns to ask respondents the same questions, thereby providing comparable answers but also allowing respondents to elaborate freely in their responses. Each question asked respondents for specific information, for example, what are the major problems faced by the fishing community, but respondents were also encouraged to expand on their answers, providing their own particular views and knowledge.

The semi-structured interviews were conducted with agency staff, fishermen, community leaders, and business owners in the communities during the summer months of 2008. Additionally, informal conversations and short encounters on docks and in fish houses added context to the formal interviews. All encounters were noted and assigned identifying numbers. Texas Parks and Wildlife Division (TPWD) staff introduced researchers to a few key informants in each bay system. Additional interviewees were identified using a chained-referral technique, but several respondents were recruited in random encounters on docks, in fish houses, and offices. Historical information on each community was collected in order to situate current changes in the fishery and in the communities as a whole. Infrastructure was noted using GPS and photographic data.

### **Galveston and Galveston Bay Communities**

The field research, again, was guided by the interview protocol developed in June 2008. Field research with fishermen in the Galveston Bay communities of Bacliff, Galveston, Kemah/ Seabrook, San Leon, and Texas City was carried out by Meredith Marchioni, at the time a doctoral student in anthropology at Florida International University. The research in the four more southern communities was completed by another intern, Beth Croucher, then a Masters graduate in anthropology at the University of Denver. She conducted the field studies in Palacios and Port O'Connor, while Lovette Miller, then a recent doctoral graduate in geography from the University of Maryland and a Houston Advanced Research Center (HARC) Post-doctoral Fellow in Human and Natural Systems, carried out the research in Seadrift and Port Lavaca. The field research was supervised by Weeks and Blount.

Interviews proved to be considerably more difficult to secure in the Galveston Bay communities than in the other communities. The difficulty appeared to stem from the fact that fishers worked from docks in semi-urban areas but typically did not live in the communities where they fished. Interviews were by necessity conducted mostly as dock intercepts. The fishers tended not to be responsive to interviews, usually having just returned from work. Follow-up "probe" questions were difficult to do, and were, accordingly, not very successful. In addition to the problem of getting detailed interviews, Hurricane Ike struck the Galveston Bay communities on September 13, 2008, severely altering the conditions of the communities and limiting any follow-up or continuation of interviews.

Given the limitations with interviews in the Galveston Bay Complex, the decision was made to omit those five communities from the cognitive ethnography results. The number of interviews was not only small, but interview length and detail were curtailed. The cognitive ethnography was focused on the Matagorda Bay and San Antonio Bay communities, and the number of interviews is shown in Table 1.

As can be seen in Table 1, 70 interviews were conducted in the four more southern communities, ranging from 13 to 20 per community. The interviews ranged from 20 minutes to more than 60 minutes, with the average being approximately 45 minutes.

**Table 2. Rate Measures of Individual Topical References within FISHERIES**

<b>FISHERIES</b>	<b>P LaVaca</b>	<b>Seadrift</b>	<b>Palacios</b>	<b>O'Connor</b>	<b>Total</b>
<b>Infrastructure</b>					
Decline # fishers	76	85	123	75	359
Decline # boats	76	8	115	65	264
Decline # employees	24	5	77	30	136
Decline processor/buyers	18	30	46	40	134
Decline # public docks	18	15	8	35	76
Decline # bait shops	0	0	0	10	10
Decline labor/availability	0	15	0	5	20
Recruitment difficulties	12	35	46	25	118
Aging population	12	0	23	15	50
No locals for crew	12	35	15	0	62
Inexperienced workers	6	5	8	0	19
Total	254	233	461	300	1248
<b>Catch Levels</b>					
Lower volume	53	75	92	6	280
Lower CPUE	53	85	39	3	207
Total	106	160	131	90	487
<b>Income/Pricing</b>					
Import price lowering	18	55	23	30	226
Decline in ex vessel price	41	35	54	25	55
Monopolistic pricing	35	60	0	15	110
Total	94	150	377	70	391
<b>Operating Expenses</b>					
High fuel prices	35	8	123	40	278
Effort buy fuel in Mexico	6	0	54	5	65
No credit/cash only	6	10	15	10	41
Increases for cost of crew	0	0	23	0	23
Boat maintenance neglect	0	5	39	10	54
Other	0	0	15	0	15
Total	47	23	269	65	404
<b>Regulations</b>					
Unspecified	0	40	0	0	40
TEDs/Fish-eyes	6	0	39	5	50
Limited entry	0	10	15	10	35
Buy back	0	0	8	10	18
Homeland Security	6	10	0	0	16
EEZ	12	5	0	0	17
Total	24	65	62	25	176
<b>Institutions</b>					
TPWD	12	55	38	0	105
Foreclosures	18	5	54	0	77
Loans	12	20	23	0	55
Banks	12	5	23	0	40
Bankruptcy	18	0	23	0	41
Local governments	6	15	8	0	29
Total	78	100	169	0	347

<b>Gear and Boat Changes</b>					
Barge construction	0	0	23	0	23
Yacht retrofitting	0	0	31	0	31
Increase in net # and size	18	5	8	15	46
Other	0	0	8	0	8
Total	18	5	70	15	108
<b>Land/Water Use Changes</b>					
Increase in pollution	59	60	15	20	154
Increase in taxes	6	15	54	60	135
Increase in condos/hotels	6	5	77	40	128
Increase in tourism	12	30	31	30	103
Expansion of industry	41	35	0	5	81
Total	124	145	177	155	601
<b>Place in Community</b>					
No longer fish community	0	85	15	25	125
Fishing present/reduced	0	0	92	45	137
Less fishing, negative impact	0	30	23	0	53
Total	0	115	130	70	315
<b>TOTALS</b>	<b>745</b>	<b>996</b>	<b>1546</b>	<b>790</b>	<b>4077</b>

## Coding Procedures

A coding procedure was developed as a means of analyzing the interviews. Blount, Weeks, and Miller compiled a list of codes, essentially topics and their keyword descriptors, independently from a selected sub-set of the interviews, 15 altogether. Each researcher also spot-checked coding across the communities to promote consistency. The three researchers compared their results several times, each producing modifications and refinements until there was complete agreement on the categories and the descriptors. Sixty items were selected for coding. As described below, each code represents a term provided by the respondents and can be said to reflect their knowledge.

The procedure for coding the data was to read through each interview and to record on a coding sheet whether the respondent mentioned or referred to one of the 60 topics (see Blount 2002, 2011; Blount and Kitner 2007). Each of the 60 topics addressed by the respondents is a representation of local knowledge, in effect, keywords. The procedure is often used in cognitive studies, the assumption being that the more salient or important a topic is to an individual, the more likely the topic will be mentioned and discussed. In the present study, the use of a keyword by a respondent was both an indication of knowledge and its relative importance. We should note that procedurally only one instance of a keyword in response to each interview question was coded as data, to preclude multiple references in a response sequence to one question. The data totals represent the number of times that a given keyword was used in each interview.

For convenience of analysis, the 60 items were subsumed under levels of higher-order categories, for example, “*decline in number of fishers*,” a keyword, is listed under *Fisheries* and then under *Infrastructure*. At the higher taxa levels, the terms likely reflect analytic categories and not necessarily local terminology, although the fishers were certainly aware of the terms and their meanings. In the final procedure, the 60 coded items were subsumed by one of two major headings, or taxa, *Fisheries* and *Individuals* (see Tables 2 and 3, below).

## Features of Data Analysis

Analyses of the code data was conducted by Blount. Total scores were calculated for each topic/code by community, and comparisons were made across communities on the basis of the totals. Given that the total number of interviews across the communities differed, the total raw scores per community were then divided by the number of interviews, to provide a standard rate measure. Since those calculations produced a high number of decimal fractions, the scores were multiplied by 100, as shown in Table 2. Comparisons were made of the rate score totals by community.

Although many of the labels/terms in Tables 2 and 3 are self-explanatory, e.g., *Decline # of fishers*, some will require additional description and explanation. Those are identified and described in the footnote, in the order in which they appear in the tables.<sup>2</sup>

Our interest here is in the comparative numbers of topics/keywords used in each community and in providing rank orders among the communities in reference to how the topics/keywords indicate resilience and vulnerability.

**Table 3. Rate Measures of Topical References on INDIVIDUALS**

INDIVIDUALS	P LaVaca	Seadrift	Palacios	O'Connor	Total
Fishing Experience					
Multi-generational	41	8	35	10	166
Family network	41	55	35	0	131
First generation	0	5	0	30	35
Total	82	140	70	40	332
Multiple Fisheries					
Unspecified	35	40	0	20	95
Oyster	35	10	20	20	85
Bait	24	40	5	5	74
Other	29	15	5	0	49
Total	123	105	30	45	303
Ownership					
Boat	24	40	35	0	99
Quota	0	15	0	20	35
Processor	0	0	15	5	20
Ice house	0	10	10	0	20
Total	24	65	60	25	174
Sources of Income					
Other: non-fishing	41	30	70	60	201
Fishing only	24	40	15	5	84
Family/wife/children	29	30	10	0	69
No Social Security	6	0	5	10	21
Total	100	100	100	75	375
Changes in Liquidity					
All assets in fishing	6	25	5	5	41
Ability to sell boats	18	10	5	15	48
Total	24	35	10	20	89
Debt Levels/Defaults	12	0	10	0	22
Skills/Education					
Marketable skills	53	35	40	25	153
Education level	53	50	15	5	123
Language skills	29	15	5	0	49
Total	135	100	60	30	325
Job Satisfaction	29	60	10	25	124
Entrepreneurship	18	5	55	45	123
TOTALS	547	610	405	305	1867

We took each of the respondents' comments that were coded into Tables 2 and 3 and asked whether the comment was related to notions of resilience or vulnerability. Did comments, for instance, about *Decline in number of boats* point in general to resilience or vulnerability? Did the comment

about having *No Social Security* point to resilience or vulnerability? The decisions were judgment calls, but in the vast majority of the cases, the intent appeared to be clear from the context in which the fishers discussed them. A *Decrease in CPUE* (catch per unit effort), for example, meant that fewer

**Table 4. Topics/Keywords that Indicate INDIVIDUALS Resilience**

Topic/Keyword	PLV	SDR	PLS	POC	Totals
Skills/Education					
Marketable skills	53	35	40	25	153
Education level	53	50	15	5	123
Language skills	29	15	5	0	49
Total	135	100	60	30	325
Sources of Income					
Other: non-fishing	41	30	70	60	201
Family/wife/children	29	30	10	0	69
Total	70	60	80	60	270
Multiple Fisheries					
Total	123	105	30	45	303
Fishing Experience					
Multi-generational	41	8	35	10	94
Family network	41	55	35	0	131
Total	82	63	70	10	225
Ownership					
Boat	24	40	35	0	99
Processor/Ice house	0	10	25	5	40
Quota	0	15	0	20	35
Total	24	65	60	25	174
Job Satisfaction					
Total	29	60	10	25	124
Entrepreneurship					
Total	18	5	55	45	123
Liquidity – Sell Boats					
Total	18	10	5	15	48
<b>TOTALS</b>	<b>499</b>	<b>468</b>	<b>370</b>	<b>255</b>	<b>1592</b>

fish could be caught with the same effort as earlier, indicating vulnerability. The results of the keywords indicative of resilience are shown below in Table 4, and those indicative of vulnerability are shown in Table 5.

In contrast to *FISHERIES*, where most of the topics can be seen as instances of vulnerability, most of the topics in *INDIVIDUALS* can be seen as instances of resilience. As can be seen in Table 5, past history and actions of individual fishers have a direct bearing on their ability to be resilient, in the fact of fishery vulnerability. Interestingly, *Skills/Education* showed the highest number of fishers' comments. Those topics, however, seem to refer more to the ability of individuals to obtain employment and income outside of fisheries, although that might also indicate that they would

be able to continue fishing part-time. In fact, social networks can be seen as constituting the overall most important individual sources of resilience, given that *Fishing Experience* and *Sources of Income* both refer to social networks, which provide support and allow individuals to continue their fishing enterprises. *Ownership* and *Multiple Fisheries* both refer to socioeconomic settings in which individuals have additional security to enable them to continue fishing as a livelihood. *Entrepreneurship* can be seen as related to *Skills/Education*, reflecting personal qualities and the ability to see how individual action may contribute to resilience and thus sustainability of the fisheries. *Job Satisfaction* provides position motivation to continue fishing as a livelihood and thus constitutes resilience.

**Table 5. Topics/Keywords that Indicate INDIVIDUALS Vulnerability**

Topic/Keyword	PLV	SDR	PLS	POC	Totals
Sources of Income					
Fishing only	24	40	15	5	84
No Social Security	6	0	5	10	21
Total	30	40	20	15	105
Changes in Liquidity					
Total	6	25	5	5	41
Fishing Experience					
Total (First generation)	0	5	0	30	35
<b>TOTALS</b>	<b>36</b>	<b>70</b>	<b>25</b>	<b>50</b>	<b>181</b>

Table 6 shows the results for resilience in the Fisheries category, and Table 7 gives the results for vulnerability.

As can be seen from Tables 6 and 7, virtually all of the topics in *FISHERIES* indicate vulnerability; only two keywords, *limited entry* and *buyback*, indicate resilience. In neutral contexts, either of those could indicate either resilience or vulnerability, but the respondents saw both of them as helpful, *limited entry* keeping the number of fishers and thus competition from increasing, and *buyback* as a safety net if fishing continued to decline economically. The results contrast strongly with the *Individuals* section, where the majority of the keywords indicate resilience, and a small minority indicate vulnerability. Interestingly, those results suggest that in the nine communities, the respondents saw the fishers as resilient but the fisheries as vulnerable. Those views reflect a perspective widely held about fishers and fisheries. Fishers are seen as determined, hard-working, persistent; in a word, resilient, whereas it is common knowledge that fisheries are in various degrees of difficulty, largely from deflation of prices from imports and from rising operating costs.

Based on the coding of the interviews, summary scores of the communities in terms of vulnerability and resilience can be made. The ranking is presented in Table 8, which shows that all of the communities have higher scores in *FISHERIES* for vulnerability than for resilience. The opposite is the case for *INDIVIDUALS*.

Even further, the *FISHERIES* and *INDIVIDUALS* scores can be combined to give a total vulnerability and a total resilience score for each community. Those can also be ranked, as shown in Table 9. Palacios shows the highest level of vulnerability; Galveston Bay has the lowest. Port Lavaca has the highest level of resilience; Port O'Connor has the lowest.

We turn now to an account of the quantitative research and rank level of the nine communities regarding vulnerability. A comparison of the results of the three methods follows.

### Quantitative Social Indicators

Four primary forms of vulnerability/resiliency are commonly found in the research literature: (1) Social; (2) Economic; (3) Ecosystem/Natural Environment; and (4) Social Disruption (see Adger et al. 2005; Luloff and Swanson 1995). These are shown in Table 10. Several quantitative indicators for each of these constructs are identified below. The cluster of indicators in Table 10 are empirical components of the broader domains of vulnerability/resiliency identified in an extensive review of literature from the project report which forms the basis of this study. The operationalization of these indicators is detailed in the methods section. In the results section, the ethnographic findings in comparison to the social indicators to establish the external validity of these measures are described.

**Table 6. Topics/Keywords that Indicate FISHERIES Resilience**

Topic/Keyword	PLV	SDR	PLS	POC	Totals
Regulations					
Limited entry	0	10	15	10	35
Buy back	0	0	8	10	18
<b>TOTALS</b>	<b>0</b>	<b>10</b>	<b>23</b>	<b>20</b>	<b>53</b>

**Table 7. Topics/Keywords that Indicate FISHERIES Vulnerability**

Topic/Keyword	PLV	SDR	PLS	POC	Totals
<b>Infrastructure</b>					
Decline # fishers	76	85	123	75	359
Decline in labor available	42	90	92	45	269
Decline # boats	76	8	115	65	264
Decline # employees	24	5	77	30	136
Decline # buyers	18	30	46	40	134
Decline # docks	18	15	8	35	76
Total	254	233	461	290	1238
<b>Land/Water Use Changes</b>					
Increase in pollution	59	60	15	20	154
Increase in taxes	6	16	54	60	136
Increase in condos/hotels	6	5	77	40	128
Increase in tourism	12	30	31	30	103
Expansion of industry	41	35	0	5	81
Total	124	146	177	155	602
<b>Catch Levels</b>					
Lower volume	53	75	92	60	280
Lower CPUE	53	85	39	30	207
Total	106	160	131	90	487
<b>Place in Community</b>					
No longer fishing community	0	85	15	25	125
Fishing present/decline	0	0	92	45	137
Less fishing/negative	0	30	23	0	53
Total	0	115	130	70	315
<b>Operating Expenses</b>					
High fuel prices	35	8	123	40	206
Fuel from Mexico	6	0	54	5	65
Boat maintenance	0	5	39	10	54
Total	41	13	216	55	325
<b>Institutions</b>					
TPWD	12	55	38	0	105
Foreclosures/Bankruptcy	36	5	77	0	118
Banks/Loans	24	25	46	0	95
Total	72	85	161	0	318
<b>Regulations</b>					
Unspecified	0	40	0	0	40
TEDs/Fish-eyes	6	0	39	5	50
Total	6	40	39	5	90
<b>TOTALS</b>	<b>603</b>	<b>792</b>	<b>1315</b>	<b>665</b>	<b>3375</b>

Three steps were taken to develop the social indicator indices that were identified in the review of literature (Table 10). First, Pearson's *r* correlation coefficients of potential

variables were examined to find underlying patterns of variation that suggested that individual variables might be used to compose a concept of interest. Second, the variables that

**Table 8. Summary Scores of Community Vulnerability and Resilience**

Community	Fisheries		Individuals	
	Vulnerability	Resilience	Vulnerability	Resilience
Port Lavaca	603	0	36	499
Seadrift	792	10	70	468
Palacios	1315	23	25	370
Port O'Connor	665	20	50	255
TOTALS	3375	53	181	1592
AVERAGE	844	13	45	398

**Table 9. Summary Scores and Community Rank for Vulnerability and Resilience**

Community	Vulnerability	Rank	Resilience	Rank
Port Lavaca	633 (4)	Low	499 (1)	High
Seadrift	862 (2)	High	478 (2)	High
Palacios	1340 (1)	High	393 (3)	High
Port O'Connor	715 (3)	Low	275 (4)	Low
AVERAGE	888		411	

**Table 10. Factors that Comprise Community Vulnerability and Resiliency**

Social Vulnerability and Resiliency	Population Composition Poverty Housing Characteristics
Economic Vulnerability and Resiliency	Economic Structure
Ecosystem/Natural Environment Resiliency	Natural Disasters Technological Disasters Regulatory Impacts
Social Disruption	Housing Disruptions Economic Disruptions Personal Disruptions

were most highly intercorrelated a reflected the range of ideas of interest were placed in a principal components analysis, where these variables were then determined to be measuring a single latent construct with sufficient association to be reliable. Last, the variables were standardized and weighted for their effects in the model. Index factor scores were used.

The data set for the quantitative research was compiled from four separate data sources. The primary source for population and housing information was the United States Bureau of the Census 1990 and 2000 Decennial Census, Summary Tape File 3. Very current population estimates and real estate value was downloaded from the website City-Data.com, which

**Table 11. Vulnerability/Resilience Indices**

Community	Quantitative Vulnerability/Resiliency Indices						
	Population Composition	Poverty	Housing Characteristics	Labor Force	Natural/Techno Disasters	Housing Disruptions	Personal Disruptions
Port Lavaca	High	High	Low	High	Low	Low	Low
Seadrift	High	High	Low	High	Low	High	Low
Port O'Connor	High	Medium	Low	High	Low	Low	Medium
Palacios	High	High	Low	High	Low	Low	High
	Quantitative Modal Response	Expert Ethnographic Assessment	Cognitive Ethnographic Assessment				
Port Lavaca	Low	Low	Low				
Seadrift	High	High	High				
Port O'Connor	Low	High	Low				
Palacios	High	High	High				

uses proprietary estimates based on United States Census data for inter-decennial population estimates and local tax records for estimating real estate values. The data for natural disaster risks was downloaded from Moving.com using a proprietary insurance database. Last, the data for technological disasters was downloaded from the Environmental Protection Agency’s (EPA) website from the EnviroMapper store front.

To ensure content validity with the constructs of vulnerability and resiliency, multiple indicators were developed (1) population composition, (2) poverty, (3) housing characteristics, (4) labor force, (5) natural and technological disasters, (6) housing disruptions, and (7) personal disruptions. To evaluate the agreement of social indicators with ethnographic research, it was necessary that the same category-levels be employed. These categories were: (1) low, (2) medium, and (3) high. These categories were assigned on the basis of factor scores. The index score for each variable was arrayed for all 122 communities into thirds based on frequency. As such, it is possible for all of the community study sites to be in the low, medium, or high category for any given index. Each separate community was coded into one of the thirds (low, medium, or high) based on the index factor score, so the response categories within the nine communities are not evenly distributed.

### Compared Rankings

Table 11 gives the results of the comparison for vulnerability of the nine communities as measured by the quantitative analyses and the expert judgment of the ethnographers. As can be seen, the rankings were the same for three of the four communities, all except for Port O’Connor. Post hoc ethnographic information explains the failure. Dur-

ing the course of the project, the owner of a major dock in Port O’Connor closed it to commercial fishing, facilitating a complete transition to recreational fishing and tourism only. The quantitative data sets did not reflect that change and thus gave a different measure.

Table 11 shows that for the communities in the San Antonio/Matagorda Bay area, there was perfect agreement in each of the four cases between the quantitative and the cognitive ethnographic results. The validity of the cognitive ethnography method was demonstrated for each community. Given the complexity of the ethnographic research, the fact that there were three different interviewers and that multiple decisions and steps were made in the creation of the data sets from the interview discourse, the agreement levels are striking. As cumbersome, time consuming, and expensive as ethnography can be, an approach utilizing the cultural cognitive models of the stakeholders produces results consonant with quantitative analytic procedures. The bottom line is that there is a “reality” of knowledge that exists in each of the communities, and that reality can be captured in different ways, quantitatively and qualitatively.

### Conclusions

Applied independently, the three methods gave similar results despite their design and organizational differences. As the results show, cognitive ethnographic results compare favorably with quantitative methods using social and economic indices and with expert investigator accounts. The mixed-methods approach constituted triangulation, thereby strengthening the confidence that each alone might have produced. In particular, the project shows the

robustness of a cognitive-based ethnography. By focusing on specific domains within fisheries and by tapping into local, experientially-based and -shared knowledge, members of fishing communities can provide accurate and insightful accounts of their resilience, vulnerability, and sense of well-being. Cognitive ethnography not only produces comparable results to other methods, but it is a useful approach when a project is designed to employ only short-term or rapid-assessment research. An additional positive outcome is that local knowledge can be ratified in the eyes of the residents. Measurements of sharing knowledge through summation of keywords and related, elaborated content can yield up-to-date results and validation of a community's well-being. Cognitive ethnography can be an important tool-kit in mixed-methods research to develop management and policy considerations. Although ethnography typically is expensive in time, energy, and monetary terms, it has the advantage of collecting information that is timely and direct.

### Notes

<sup>1</sup>The key terms below provide minimal definitions of reference within fishing communities and fishery management regimes. Their characterization as indicative of resilience or vulnerability depends, however, on the particular time and extant circumstances. *Individual fishing quotas*, for example, may be seen typically as indicative of vulnerability, but once established and successfully operating, fishers may see it as positive and a sign of resilience in the face of further change or sector competition.

*Low import price* refers to the deflation of ex-vessel price of shrimp due to the volume and lower prices of imported fish.

*Decline in ex-vessel price* potentially overlaps with *Low import price*, but landing values for some species have declined independently.

*Other* refers to any *Operating Expenses* other than the ones listed. Examples are the increased costs incurred from having to stay on the water longer to make profitable levels of catch and the increased costs of boat repairs.

*Monopolistic pricing* refers to instances in which respondents noted that they have problems selling their catch at market rates, given that they have access to only one dealer or buyer, who can set the buying price at any chosen, that is, monopolistic level.

*Homeland Security* refers mainly to problems of recruiting workers but also to difficulties encountered on reentering United States waters after trips to Mexico to buy cheaper fuel.

*EEZ* refers to the additional constraints/regulations placed on fishers when they enter federal waters beyond three miles offshore.

*TPWD* refers to constraints/regulations imposed by the Texas Parks and Wildlife Division (typically seen negatively).

*Banks* refers to the unwillingness of banking institutions to provide loans for fishers, especially in times of crisis and thus critical needs.

*Barge construction* and *yacht retrofitting* refer to observed trends in new boat construction businesses at docks and marinas, in which barges are constructed and fishing boats are retrofitted into pleasure yachts, reflecting a de-emphasis in commercial fishing toward other commercial or recreational interests.

*Place in Community* refers to whether the respondents view the community now as a fishing community or whether it has changed to the point that the term no longer applies.

*Multiple Fisheries* refers to instances in which an individual is currently or in the past has participated in more than one fishery.

*Changes in Liquidity* refer to whether the fisher has assets that can be sold or converted into cash.

*Skills/Education* was seen as factors that could enable a fisher to pursue other livelihood options, either as career or as providing access

to other income. Conversely, their absence meant that fishers had no options for other livelihoods or livelihood support.

*Entrepreneurship* is a cover term that includes reports of instances in which fishers saw and took opportunities to improve their incomes and livelihood status.

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