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Intracultural Variability in the Cognition of Danger Among Southern New England Fishers

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Abstract *The costs of the dangers of commercial fishing are very high, yet fishing vessel safety regulations are frequently met with lack of enthusiasm or even rejection by fishers. Why would fishers reject regulations designed to increase their safety? There is a strong possibility that some of the rejection is the result of lack of cognitive sharing and communication between originators of the regulations and the fishers for whom the regulations are designed. This paper examines the pattern of cognition about danger of the occupation among fishers and relates these patterns to sociocultural differences in two southern New England ports. The intent of the study is to help bridge the gap between regulators and users by providing culturally appropriate information that can be used to design more effective policy, training, and enforcement programs.*

Key words Cognition of fishers, culturally appropriate regulations, danger of fishing, maritime anthropology, New England fishers, safety regulations.

Introduction

The dangers involved in commercial fishing at sea are costly to both the individuals involved and society as a whole (National Research Council 1991). Every year many fishers are injured and lose their lives at sea; expensive equipment is damaged or lost; and a costly rescue service must be maintained to respond to vessels in distress. Fishing vessel safety regulations have been implemented to reduce these costs, but they also result in costs to the fishers in terms of new equipment and training, and to society in terms of enforcement. What many find difficult to understand, however, is the fishers' unenthusiastic response to these attempts to improve their safety. Mandated equipment is purchased but too often ignored or improperly deployed. EPIRBs provide a good example. An EPIRB is an emergency positioning device which automatically transmits a message when immersed in water. The message includes a code, which identifies the vessel (if the EPIRB is registered), and the exact location is triangulated by satellites which receive the message. Required EPIRBs are sometimes not registered, they are not placed in their brackets where

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they will automatically float free of the boat if the boat capsizes (*e.g.*, they are put in a drawer in the wheelhouse to prevent theft and not redeployed when the ship is at sea), or their batteries not checked as required (for other examples see Poggie, *et al.* 1995). Additionally, safety training is delayed as long as possible with the rationalization that "we already know what to do." Binkley reported that many Nova Scotia fishers she interviewed said they all knew the right answers when examined in a safety course, but they did not believe what they were taught (1991:181). Is this a problem in communication?

Anthropologists have long maintained the view that it is essential to understand the perspective or world view of "others" if we wish to communicate with a high degree of cognitive sharing. Otherwise, it is argued, people with different world views will talk past each other and very little communication will take place. A negative example of this principle at work was observed while attending a public hearing on New England fisheries management where a government biologist was reporting, primarily to fishers in the audience, the results of a study where random sampling was used to ascertain the size of fish populations in an area slated for management restrictions. A fisher, whose livelihood could be adversely affected by the results being reported, stood up and said that he did not want his livelihood threatened by the randomness involved in the "flipping of a coin." To him random meant a "flip of the coin," a haphazard method. Both the biologist and fisher were being honest and well-intentioned and were trying to do their jobs to the best of their abilities; however, they were not communicating because they did not share the same cognition regarding the meaning of the concept of random.

The two men in this example belong to two different sub-cultures, with different sets of ideas that impede cross-cultural communication. Applied anthropologists (and others) have worked for many decades to provide necessary information on the thinking of "others" to help facilitate better cross-cultural understanding and communication. Recently in informal interviews with Southern New England fishers about newly instituted safety regulations, we have heard many statements reminiscent of the fisher and the biologist episode. These statements indicate to us that a considerable degree of non-sharing exists in regard to the dangers of fishing that new regulations are designed to address. It is also apparent that there are differences among fishers with respect to these views. Intracultural variation in attitudes, beliefs, and values among fishers has been described for several domains (*e.g.*, Poggie 1992; Gatewood and McCay 1990; Pollnac and Poggie 1988), and many anthropologists have been led to expect this type of variation as a normal part of human culture (Pelto and Pelto 1975). It is important that regulators, and others who deal with fishing safety issues, better understand perceptions of fishers concerning safety hazards if they wish to communicate well and maximize the impacts of safety regulations and safety training programs. As in the case of assessing stocks recounted above, what is needed is a better understanding of this domain of the sub-culture of commercial fishing (see also Smith 1990; Poggie, *et al.* 1995). It is also important to identify specific categories of fishers whose views on safety hazards could most benefit from safety training programs.

The purpose of this paper is to determine the sociocultural correlates of differences in evaluation of factors associated with the danger of commercial fishing accidents among fishers in Southern New England. It is anticipated that fishers' evaluations of the relative importance of different causal factors will be useful to personnel interested in promoting fishing vessel safety. This information should facilitate the development of culturally appropriate training and enforcement programs.

Potential correlates of variance in fishers' perceptions of commercial fishing accidents were identified from previous research, participant observation, and key informant interviews conducted in the first stage of the research. Variables identified

include a fisher's age and fishing experience (see also Binkley 1991; Pollnac and Poggie 1990), type of fishing (see also Binkley 1991; McCay 1991; McCay, *et al.* 1989) including days at sea and distance from port, whether or not a vessel is owner operated, the kinship status of crew members, whether or not a crew uses transients, formal education (including technical training), and home port (see also Pollnac and Poggie 1990). Sociocultural correlates of differences in evaluation of causal factors can lead to identification of subgroups manifesting differential perceptions of dangers in the occupation, enabling the development of intervention programs tailored to the needs of specific groups of individuals.

Causes of Accidents

A number of variables have been identified in the literature as being associated with fishing vessel accidents (cf. National Research Council 1991). To develop a list of culturally appropriate variables with regional significance, the present research derived potential causes of fishing accidents from in-depth interviews with local fishers, Coast Guard personnel, fishing vessel accident investigators, and fishing vessel safety training personnel. Variables most salient to those interviewed (*e.g.*, given most emphasis and/or mentioned most frequently) were selected for further analysis (table 1). Items specifically mentioned as influencing accidents to fishers (personnel accidents) were kept separate from those impacting the vessel. There is, of course, overlap between the two lists, but since informants discussed them separately in the interviews, they were separated in the sample survey interviews to maintain cultural appropriateness.

Evaluation of Causes

Methods

As part of a larger interview schedule, fishers were requested to evaluate, in terms of relative importance in causing accidents, each of the fourteen items listed in table 1. Each fisher ranked each item on a five point scale ranging from (1) unimportant to (5) very important. A random sample of 121 fishers, representative of the different types of fishing found in Point Judith, Rhode Island (N = 41) and New Bedford, Massachusetts (N = 80) were interviewed.

Table 1
Variables influencing commercial fishing accidents.

Variables Affecting Accidents	
To Fishermen	To Fishing Vessel
Fisherman's age	Location of boat
Fisherman's job on board	Day versus night
Location on board vessel	Visibility
Vessel age	Windspeed
Time of year	Sea conditions
Vessel size	Hull type
Carelessness	Captain or crew error

Analysis

As a first step in the analysis of the data derived from this task, modal rank and percent responding with this rank for each of the fourteen causal items were calculated. Results of this analysis are in table 2.

Fishers' responses to all items varied between "not at all important (score = 1) and "very important" (score = 5). Items with modal values of four and above in table 2 are clearly considered by fishers as important causal factors associated with accidents. The most significant aspect of the data used to produce table 2, however, is the amount of variation fishers manifested with respect to their responses. Analyses presented below focus on factors influencing the variation in response patterns.

The next step in the analysis is based on the assumption that covariance in the perception of relative importance of factors influencing fishing accidents can be used to define sets of interrelated accident causes which can improve our understanding of fishers' conceptualization of risk. Principal component factor analysis with varimax rotation of factors was used to determine patterns in variability in evaluations of the fourteen causal items. The scree-test, which limits factors derived on the basis of a leveling-out of percent of total variance explained, was used to define number of factors (Cattell 1966). Based on this test three factors were derived. Table 3 displays the results of this part of the analysis.

Table 2
Fishers' Perceptions of Importance of Variables Associated with Fishing Accidents

Variables Affecting Accidents					
To Fishermen	Mode	(%)	To Fishing Vessel	Mode	(%)
Fisherman's age	1	(37)	Location of boat	3	(30)
Fisherman's job on board	1	(31)	Day versus night	1	(28)
Location on board vessel	5	(49)	Visibility	5	(57)
Vessel age	3	(27)	Windspeed	5	(50)
Time of year	5	(63)	Sea conditions	5	(51)
Vessel size	3	(31)	Hull type	1	(50)
Carelessness	5	(75)	Captain/crew error	5	(52)

Table 3
Factor Analysis of Causal Items.

	CAUSE1	CAUSE2	CAUSE3
Fisherman's job on board	0.67	0.13	–0.25
Fisherman's age	0.63	–0.01	0.05
Hull type	0.63	0.16	0.09
Location on board vessel	0.57	0.21	0.07
Visibility	0.41	0.12	0.20
Vessel age	0.39	–0.24	0.22
Sea conditions	–0.01	0.89	0.07
Windspeed	0.13	0.83	0.09
Location of boat	0.36	0.43	0.24
Time of year	0.08	0.40	–0.10
Vessel size	0.27	0.29	0.16
Carelessness	–0.07	0.05	0.73
Human error	0.20	–0.01	0.73
Day versus night	0.10	0.04	0.54
Percent total variance	15.5	14.8	11.7

Items in table 3 are arranged in terms of magnitude of loading on the three factors. For example, the first six items have their highest loadings on factor one (CAUSE1), with fishers' job on board having the highest loading and vessel age the lowest. The next five items have their highest loadings on factor two (CAUSE2), and the final three, on factor three (CAUSE3).

Except for visibility, items that loaded highest on factor one are intrinsic to the vessel, fisher, or fisher's job. CAUSE1, therefore seems to be composed of items that can be labeled as "internal." Conceptualizing the factor as "internal" suggests that "visibility," as a concept, belongs to the factor since it links the internal with the external.

Factor two is clearly composed of external items: sea conditions, windspeed, time of year, and vessel location. Vessel size has a relatively low loading on factor two, almost the same as its loading on factor one; hence, it can be considered as a shared item. Factor three appears to be related to human decision making. Human error and carelessness both involve decisions; and nighttime, the time usually devoted to sleep, affects the decision making ability of many people.

Item loadings of the three factors are plotted in the three dimensional causal factor space in figure 1. Time of day, human error, and carelessness are clustered low, in the far right corner of the space. Externalities such as wind, seas, and season are high in the near right quadrant. Fisher's job, work location, age, and hull type are clustered in the near left corner, and visibility, which links the external with the internal, is at moderate height in the center of the factor space.

Standardized factor scores were calculated for each fisher in the sample on each factor. These factor scores reflect the relative importance attributed to each item weighted according to the item's factor loading. Hence, a fisher with a high factor score for CAUSE1, rated the internal causal items as relatively important. Correla-

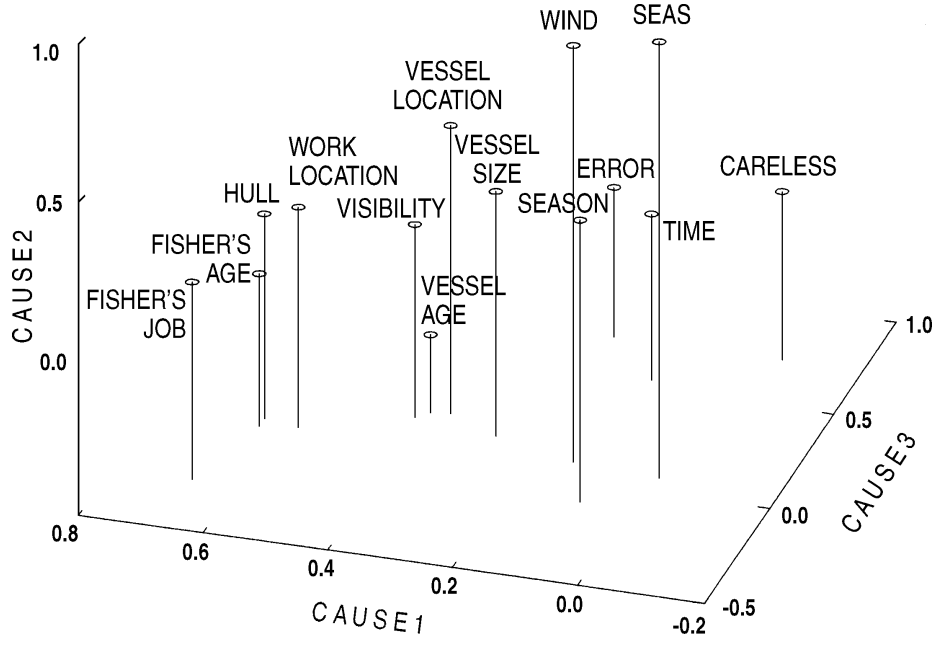

Figure 1. Plot of Items in Three-Dimensional Factor Space

tions between factor scores for fishers on each factor and the sociocultural and technical variables proposed as influencing perceptions of factors contributing to fishing accidents are found in table 4.

The correlations in table 4 indicate that fishers on scallopers, larger vessels, vessels with larger crews, and vessels that take trips of longer duration are more likely to ascribe a higher level of importance to internal, potential accident causes (CAUSE1). All the variables correlated with CAUSE1 are also highly correlated with fishing from a scallop vessel. This set of variables is so highly intercorrelated (the four predictor variables have much higher correlations with each other than with the dependent variable) that the potential for multicollinearity makes it improper to use multiple regression to determine the most important predictor variable. Further, the correlation between scalloper and CAUSE1 is not significantly different from the correlations between the other three independent variables (crew size, maximum days, and vessel length; t = 0.91, 0.99, and 0.14, respectively; all $p >$ 0.20) and CAUSE1; hence, we cannot make any decisions as to the "most important" based on the size of the correlation coefficient. Vessel conditions, location and job on board all impact exposure to danger on a scalloper with the tons of metal chain dredging gear swinging over and falling to the deck. Dragger fishers tend to rank internal items lower in terms of importance in causing accidents.

Correlates of CAUSE2 (the external dimension) are interesting. Home port (Point Judith) has the strongest correlation. The other three strong correlates (education, maximum days, and lobster fishing) are themselves significantly correlated with home port (r = 0.30, –0.72, and 0.46 respectively; all $p < 0.01$). When port is controlled, however, the partial correlations between CAUSE2 and the two independent variables maximum days and lobster fishing drop a great deal (–0.10, p = 0.33

Table 4
Zero-Order Correlations Between Independent Variables and Factor Scores.

Independent Variable	CAUSE1	CAUSE2	CAUSE3
Age	–0.08	0.06	–0.05
Education	0.05	–0.22*	0.22*
Children	–0.11	–0.02	–0.01
Kin/crew	0.13	0.04	–0.03
Married	–0.15	–0.02	–0.10
Crew Size	0.35**	0.12	–0.18
Dependents	–0.10	–0.01	–0.05
Home port	–0.06	–0.34**	0.38**
Position	0.02	0.15	–0.04
Maximum days	0.24**	0.27**	–0.29**
Maximum distance	0.05	0.15	–0.33**
Owner-operated	–0.11	–0.12	0.32**
Crew changes	0.10	–0.09	–0.11
Transients	0.03	0.07	–0.09
Vessel length	0.30**	0.16	–0.11
Dragger	–0.31**	0.01	–0.04
Scalloper	0.31**	0.13	–0.06
Lobster boat	0.03	–0.23*	0.17
Years fishing	–0.06	0.01	0.01
Safety trained	0.02	–0.12	0.16
Technical training	0.11	0.02	–0.05

* = $p < 0.05$, ** = $p < 0.01$

and 0.05, $p = 0.63$ respectively), and the correlation with education drops only slightly ($r = 0.16$, $p = 0.10$). This suggests that the more education fishers have the more likely they are to see external conditions as being unimportant—internal variables such as technology and the human decision maker can compensate. But, it also appears that the longer one is uninterruptedly battered by the elements,[1] as evidenced by longer trips, the more likely one is to evaluate external variables as significant factors affecting fishing accidents.

Patterning of these same two variables (education and trip length) with CAUSE3 (the human decision making dimension) seems to support this explanation. The more educated are more likely to ascribe importance to human decision making. Length of exposure to the elements, however, results in more emphasis on the external factors and less on the human as influencing accidents. It appears that the longer the exposure to nature, the less importance ascribed to the impacts of human decisions. Using this same logic, distance from port probably increases one's feeling of being under the control of nature as opposed to the human mind.

The positive correlation of CAUSE3 with fishing from an owner-operated vessel is quite interesting. Perhaps, the owner operator being on board, constantly aware of the impacts of human error on his personal property and impressing his concerns on the crew, impacts their thinking about the importance of human error and carelessness.

Discussion

Given these patterns of thinking[2] concerning the importance of variables affecting accidents, we can ask the question, "Which of these patterns of belief about causes are closest to the actual pattern of accidents?" To answer this question the best source of statistical information comes from the United States Coast Guard's CASMAIN data file. Data for comparison were derived from the Coast Guard's fishing vessel casualty data file (CASMAIN) from District 1, the Northeast sector for the years 1980 to 1991. The computer files containing these data were obtained from the Coast Guard under the Freedom of Information Act. Analysis of this data indicates that in terms of accidents resulting in total loss of vessel, the main reported causal factor is human error, followed by what have been termed here internal causes. External factors appear to be least important as causes of total vessel loss. While it is true that we did not complicate our question by specifying the exact type of accident, we feel that "total loss" is the most salient type of accident; hence, the accident most likely conceptualized when responding to our generalized questions.

The findings presented here suggest that interventions, such as training programs, can be designed to have maximal impact in topical areas where specific groups of fishers have perceptions which differ from what data suggest are important causal factors in fishing accidents. For example, the significant negative relationship between trip length (both distance and time) and identification of human decision making as a factor in accidents, suggests that this aspect should be stressed in training programs directed at fishers in long trip fisheries. This not only makes sense, but it would be a more appropriate allocation of training time.

Our participant observation research has led to the conclusion that commercial

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[1] Years fishing evidently does not have the same effect. Short trips, interrupted by periods ashore, apparently results in a much more benign perception of the oceanic environment than that engendered by prolonged, constant exposure.

[2] Informal discussions with several fishing captains from the area lend support to the findings presented here. It should be noted that lack of agreement on the part of the same group of captains would not negate findings based on appropriately conducted survey research.

fishers often deal with danger in their occupation by denial and unrealistic evaluation of potential impacts of various accident types (see Pollnac, Poggie, and VanDusen 1995). By denying and unrealistically evaluating danger they may be buffering themselves from the immediate psychological stress of working in a high danger environment; but at the same time, they may be creating an unrealistic mental environment for themselves where real danger is not being adequately addressed. Research directed at understanding fishers' cognition of danger can be used to develop training programs providing rational techniques for coping with the all-too-real dangers associated with commercial fishing.

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