

Outer Continental Shelf (OCS) Oil and Gas Exploration: Implications for Coastal Communities and Their Fishing Industries

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ABSTRACT

In August of 1992, the Coastal North Carolina Socioeconomic Study was initiated to provide information to the Minerals Management Service, U.S. Department of Interior, for management decisions pertaining to oil and gas exploration off the coast of North Carolina. The design of the study follows the recommendation of an Environmental Sciences Review Panel (ESRP), appointed in December of 1990, that current socioeconomic and sociocultural conditions in potentially affected communities be documented prior to any Outer Continental Shelf (OCS) activity on Manteo Site 467, situated 45 miles northeast of Cape Hatteras.

During the course of the study, the following objectives guided data gathering and analysis for five counties and seven communities: (1) development of an adequate base case characterization of selected counties and communities likely to be affected by the OCS activity; (2) conduct of community specific case studies (*i.e.*, ethnographic profiles of community structure and functioning); (3) examination of community infrastructure; (4) examination of community based aesthetic values pertaining to the sociocultural and physical environments, and perceptions of risk to them; and (5) the incorporation of representative aspects of 1 through 4 into an ongoing socioeconomic monitoring program.

The purpose of this paper is to summarize key findings from the study as they relate to marine resource utilization, specifically commercial and recreational fishing activity. Further, the paper examines variation in community structure and socioeconomic dependence on water resources in the area where OCS activity might occur. The intent was to examine the social structural framework within which variations in community perceptions of risk to the environment develop.

Finally, the paper addresses the applicability of the study's methodology and findings for other geographical corridors where oil and/or gas exploration has taken place or will occur, specifically the Gulf of Mexico region.

KEY WORDS: community type, cultural framework, Manteo Prospect, offshore drilling, perceptions, preservation ethic.

INTRODUCTION

In September of 1989, Mobil Oil Exploration and Producing Southeast, Inc. filed a plan to drill an exploratory well 45 miles east-northeast of Cape Hatteras,

North Carolina (Figure 1). Named the Manteo Prospect, the area is believed to contain as much as five trillion cubic feet of natural gas.

Two months prior to the filing, the State of North Carolina, the Minerals Management Service (Department of Interior), and Mobil entered into an agreement outlining the process to be implemented for reviewing an Exploration Plan. This was followed by a series of public meetings and workshops designed to collect information related to areas of concern to residents in coastal communities. The information was published in a three volume Final Environmental Report, published in August of 1990, and dealt with both gas and oil exploration.

Following passage of the Oil Pollution Act in the Fall of 1990, owing to a section entitled the Outer Banks Protection Act, the Secretary of the Interior was prohibited from, among other things, approving any exploration plan until a special review panel was convened. The purpose of developing the panel, labelled the Environmental Sciences Review Panel (ESRP), was to assess the adequacy of information describing that portion of the environment which would be potentially affected by Outer Continental Shelf exploration and development activities. The panel was convened in December 1990, and published a report in Spring 1992.

From a socioeconomic standpoint, the ESRP report indicated that the proximity of the Manteo Prospect contributes to the possibility for two general categories of socioeconomic impacts from exploration activities: (1) effects on human populations resulting from development facilities needed to implement exploration; (2) effects of potential maritime accidents on ocean dependent industries and coastal communities. Based on their findings, the panel recommended that detailed study and analysis of historical and existing socioeconomic conditions, including trends, must be undertaken in order for the proper authorities to make informed decisions. Further, the rationale was that baseline knowledge would provide a basis from which comparisons could be made in the future.

In August of 1992, the Minerals Management Service and East Carolina University (ECU) entered into a Cooperative Agreement to conduct a comprehensive and multi-faceted research program to address the ESRP recommendations. In turn, ECU entered into a subcontract with Impact Assessment, Inc. for assistance in the management of field work, data analysis, and report writing. Five tasks were outlined: (1) Base Case characterization of selected counties and communities which would characterize the structures of relevant industries, and the relationships among both private and public sectors; and (2) Community Studies to examine the range of sociocultural variables to provide a contextual understanding of the role and potential effects of nearby OCS activities; (3) Aesthetic Value/Perception of Risk analysis, that is, examination of human perceptions of the environment, how it is valued, and

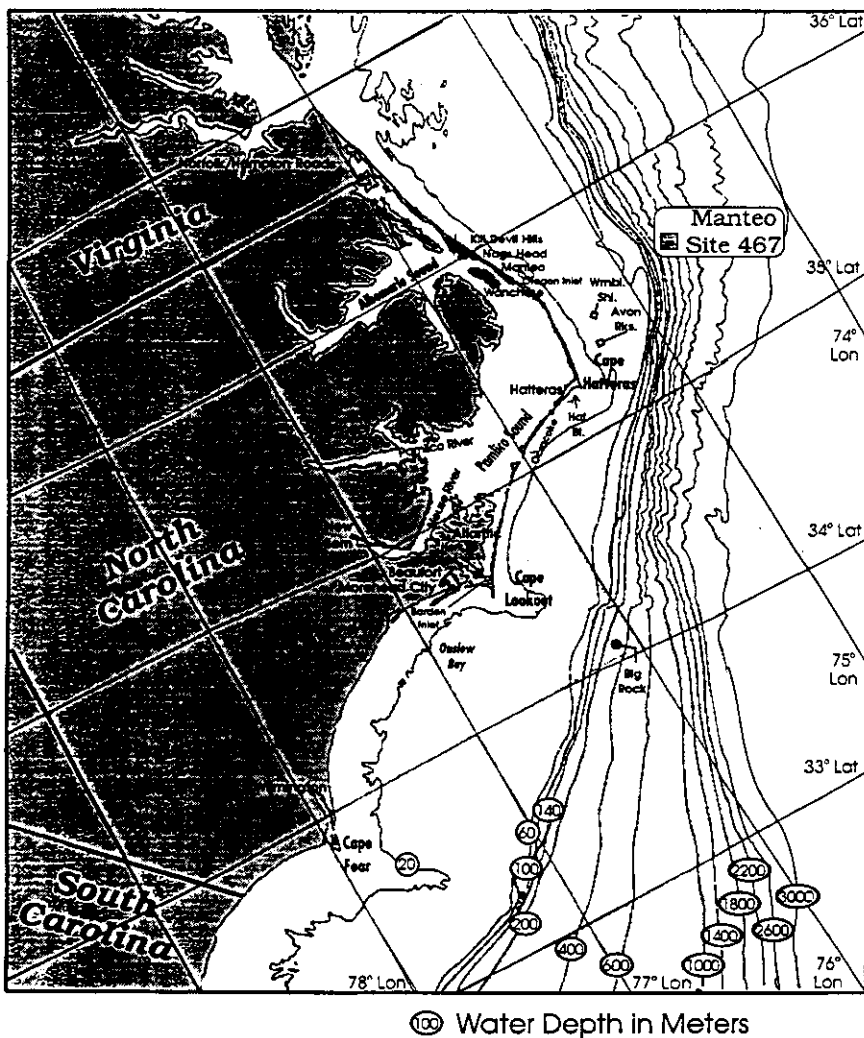


Figure 1. Location of exploratory drill sites, study communities, and fishing grounds.

perceived risks from OCS activity and other sources; (4) Infrastructure Issue Analysis involving the potential impacts as they relate to revenue sources, distribution of financial burdens, and selected sociopolitical variables; (5) Preliminary Design of a Longitudinal Monitoring System so that effects of OCS activity on the coastal zone could be assessed over time. The geographical focus of the study extended from Norfolk, Virginia, southward to Morehead City, North Carolina, and included intensive ethnographic research in seven communities discussed below. This paper will be limited to discussion of the seven communities in which the ethnographic research was conducted. The reader is referred to the Final Report (ECU and IA, 1993, submitted to the Minerals Management Service, US Department of Interior, for descriptions of the study area beyond the seven communities.

The research program provided a unique opportunity to develop in-depth analyses of one of the most unique and historically interesting coastal areas in the world. The purpose of this paper is to summarize key findings from Tasks 1, 2, and 3, in regard to marine resource utilization, specifically commercial and recreational fishing activity. Further, the paper examines variation in community structure and environmental perceptions as they relate to socioeconomic dependence on types of water resources in the area where OCS activity might occur. The intention is to outline the social structural framework within which variations in community perceptions on a variety areas of change and risk to the environment develop.

Description of Study Area, and Selection of Communities

For our purposes, coastal North Carolina may be characterized by three types of communities. The first is the comparatively isolated fishing/farming littorals which surround the sounds, bays, and rivers. The second is the tourist dominated type of community which shifts from quiet isolation in the offseason, to an active and bustling resort community during the warm months. Many of these communities contain active commercial fishing throughout the year. The third type is the larger community with some light manufacturing, in some cases, influenced by the presence of nearby military reservations, and financially dependent upon nearby resort communities. Two of these (Wilmington and Morehead City) have thriving commercial seaports. Seafood processing and sales is a major activity in virtually all communities of the third type.

Seven communities were chosen for intensive study which met the following criteria: (1) they would represent the range of coastal communities in terms of variety of dependence on a number of economic activities, including marine resources; and (2) they would vary in size, population growth patterns, location, and a range of other sociological factors, such as degree of isolation and recreational use of the coastal environment. As such, they might be affected in varying degrees, and directly or indirectly, by OCS related activity in regard

to the two categories of socioeconomic impacts described in the introductory section of this paper. Identification of the communities is revealed in Table 1. Each of the communities listed is dominated by a water dependent economy, in general, and the ocean waters adjacent to the Manteo Prospect, specifically. This includes the Pamlico Sound community of Atlantic whose commercial fleet harvests fish near the Prospect.

Table 2 provides a comparison of communities in terms of demographic variables. Table 3 reveals information on the principal sources of private sector revenues in each community. It can be seen from the tables that the communities do, indeed, vary according to the descriptions of the three types of coastal communities discussed above. It can be seen, also, that all of the communities are totally dependent upon nearby saltwater resources. This dependence is perceived and confirmed by information obtained from 20 key informants in each of the seven communities (140 total), as revealed in Tables 4 and 5. Initial ethnographic research was used to create a list of desirable attributes of coastal communities. A pilot study encouraged respondents to freely list attributes, from which a narrowing process occurred in order to determine the most common attributes as labelled in the words of the respondents. Areas of overlap occurred which indicated the variety of ways in which the attributes are perceived. A common list of attributes then was presented to the 140 respondents selected for intensive interviewing on that subject. They were asked to sort and rank the attributes that most characterize their communities. Table 4 indicates that the respondents communities, regardless of size, location along the coastline, and dominant industry(ies) in their communities, uniformly ranked water related attributes in the top five.

The same exercise was conducted in order to identify uses of environmental resources. Table 5 reveals information on the five most common uses. Water resource are the only ones present with the exception of park visits on Hatteras Island. The parks, it should be noted, are ocean side, and contain campgrounds, wild pony preserves, and hiking trails. Table 5 also confirms our earlier descriptions of community types, some potential effects of which will be examined later in this paper. It can be seen, also, that commercial or recreational fishing are perceived to be among the top three environmental uses in all of the communities except for Beaufort (4th and 5th). The following discussion describes the variety of the study area's fishery resources, and their location in proximity to the Manteo Prospect.

Marine Resource Utilization Patterns in the Study Area

North Carolina's sounds, and the adjacent Atlantic Ocean near the Manteo Prospect, provide a rich and varied abundance of living marine resources from which thousands of North Carolinians make their living, and allow thousands of others to participate in recreational activities. Both the commercial and

Table 1. Identification and location of counties and communities subject to intensive ethnographic research.

Section	County	Community	Coastal/Inland
North	Dare	Wanchese	Coastal
	Dare	Nag's Head	Coastal
	Dare	Hatteras Island	Coastal
North	Hyde	Ocracoke Island	Coastal
Central	Carteret	Morehead City	Coastal
Central	Carteret	Beaufort	Coastal
Central	Carteret	Atlantic	Inland

Table 2. Comparisons of communities using demographic variables.

Community	1990 Permanent Population	Number and (%) Of Seasonal Rental Units	Seasonal Population Variation
Wanchese	1380	10 (2)	Insignificant
Nag's Head	1838	955 (31)	Significant
Hatteras Is.	1660	490 (26)	Significant
Ocracoke Is.	7131	42 (24)	Significant
Atlantic	808	38 (11)	InSignificant
Morehead City	6048	277 (9)	Significant

Table 3. Comparisons of communities by principal private sector sources of revenue.

Community	Principal Private Sector Source of Revenue
Wanchese	Commercial Fishing
Nag's Head	Tourism
Hatteras	Tourism/Commercial Fishing
Ocracoke	Tourism
Atlantic	Commercial Fishing
Beaufort	Tourism
Morehead City	Tourism

Table 4. Comparisons of rank ordering of five most desirable community attributes.

Community	Rank Order of Attributes
Wanchese	Family Ties Clean Air Small Town Atmosphere Peace and Quiet
Atlantic	Water Related Lifestyle Water Related Lifestyle Clean Air Good Seafood Live Close to Ocean and Sound
Hatteras Island	Small Town Atmosphere Natural Beauty Live Close to Ocean and Sound Clean Air
Ocracoke Island	Family Ties Water Related Lifestyle Natural Beauty Close To Ocean and Sound Water Related Lifestyle Small Town Atmosphere Clean Air
Nag's Head	Close to Ocean and Sound Natural Beauty Water Related Lifestyle Surfing
Beaufort	Seasonal Lifestyle Natural Beauty Close to Ocean and Sound Clean Air
Morehead City	Small Town Atmosphere Water Related Lifestyle Close to Ocean and Sound Water Related Lifestyle Mild Climate Small Town Atmosphere Natural Beauty

Table 5. Comparisons of rank ordering of five most common uses of uses of the environment.

Community	Rank Order of Uses
Wanchese	Crabbing Oystering Commercial Fishing Boating Clamming Atlantic Clamming Crabbing Commercial Fishing Boating Oystering
Hatteras Island	Surf Fishing Visit Parks Commercial Fishing Surfing Swimming
Ocracoke Island	Commercial Fishing Swimming Surf Fishing Crabbing Boating
Nag's Head	Surf Fishing Swimming Sun Bathing Surfing Windsurfing
Beaufort	Boating Sun Bathing Sailing Commercial Fishing Clamming
Morehead City	Offshore Recreational Fishing Boating Commercial Fishing Surf Fishing Swimming

recreational fishermen take advantage of seasonal migrations of a wide variety of fish species by changing gear and locations, and by targeting different species. For the most part, such changes occur similarly each year, and constitute an "annual round." Because of the proximity of the fishing activity to the Manteo Prospect, normal OCS activity (*e.g.*, drilling, shipping), and certainly an accident, such as a spill, could have far reaching effects on one of North Carolina's major industries. The potential scope of the effects can be seen from the following descriptions of fishing activity. The descriptions in this paper are limited ocean harvesting; see Volume I of the Final Report for descriptions of fishing in the sounds (ECU and IA, 1993).

Near and Offshore Fishing

In regard to ocean harvesting, North Carolina's 30 million dollar plus commercial fishing industry can be divided into two distinct domains. The reader should keep in mind that nearly two-thirds of the total value of the commercial fishing industry in the state is harvested in the study area.

The first domain is the large vessel industrial fishery, menhaden, which are currently processed mainly for animal feed and oil for export to Europe (Garrity, 1985; Maiolo and Garrity-Blake, 1992; Coastal North Carolina Socioeconomic Study [CNCSES] Final Report, Volume I, 1993); and the small to large vessel food fishery, of which shrimp is king (Maiolo and Bort, 1980). However, a variety of other food fishes are harvested as well.

In regard to menhaden, the range of prosecution of the fishery in North Carolina is from the Virginia line to Cape Fear, and the season extends throughout the calendar year. Vessels from Beaufort NC, in the 90 to 100 foot range, in combination with aluminum skiffs, set nets to encircle the schools of menhaden. The nets are pursed and the fish are slurried on board the larger vessels. Even though the range of the species extends east of the shoreline to the 200 meter line (110 fathoms), ninety-five percent of the sets are within three miles of the shoreline. Most of the harvest, however, is North of Hatteras Inlet to the Virginia line, West of the Manteo Prospect. About 50 people's livelihoods depend upon this fishery in harvesting, processing, and management, of which certain portions are economically "marginal" (see Orbach, 1989:202). Other parts of the constituency of the fishery include users of the products, and boatyards and chandleries which service the large commercial craft.

The shrimp fishery is prosecuted in the sounds, and nearshore in the ocean up to 20 meters (10 to 11 fathoms). Shrimping is the most economically important food fish in the state, from the standpoint of exvessel values, and is in constant competition with menhaden in that regard. However, if one takes into account the number of vessels with licenses, plus shoreside personnel and sales from processing plants, the sound based blue crab fishery (7,605 licenses) is the most important fishery economically.

In 1991, there were 7,105 boats licensed to fish for shrimp in the state (full and part time). About half of the annual five to 21 million dollar harvest is landed in Carteret County (mid-coast). Of the three species harvested (brown—*Penaeus azteca*, white—*Penaeus setiferus*, and pink—*Penaeus durorum*), the only one found in commercially significant numbers at the northern portion of the study area (North of Hatteras) is the brown, or summer shrimp. Some of the vessels which fish for shrimp also harvest calico scallops North of Cape Lookout when commercially significant concentrations are discovered.

Some shrimp vessels also harvest finfish in the winter months. The remainder of the study area's ocean fleet consists of about 80 trawlers (from 50 to 75 feet) which target only finfish; the ocean gillnet fleet, consisting of about 100 smaller vessels; and a small fleet of fifty to sixty medium sized vessels (the exceptions being headboats) of hook and line fishermen, with reef fish as the target preference, throughout the year. Some of these vessels (26 or more) and fishermen are based in inland communities (Englehard, Vandemere, Oriental) along the sounds and rivers but depend upon the resources in the ocean near the Manteo Prospect as well as in the oceanside communities of Wanchese, Morehead City, and Beaufort. Fish are sold to dealers in other states as well as to those in North Carolina.

The species of finfish harvested from near the shoreline to depths of 128 meters near the Manteo Prospect, include flounder, weakfish, croaker, bluefish, snapper, grouper, mackerel, wahoo, triggerfish, tilefish, and dolphin fish. Types of gear used include deepwater trawls, sinknets, and hook and line. Black sea bass traps are used in the mid-coast area.

In the near and offshore waters of North Carolina, the most popular species targeted by the charter and privately owned boats, are the pelagics. The larger the boat, the more likely the targets are billfish, wahoo, tuna, and dolphin, with incidental and opportunistic fishing for the mackerels. Smaller vessels target king mackerel, followed by dolphin, wahoo and Spanish mackerel. Billfish are not targeted by smaller vessels, but it is not uncommon for smaller vessels to have incidental catches of sailfish and white marlin, if the weather permits them to travel to the deep water, particularly near the Big Rock (Figure 1).

It is not uncommon for fishing vessels from the northern and southern portions of the study area to fish the same locations. Boats traveling from Oregon Inlet are likely, however, to fish near the "Point," an area off of Cape Hatteras, slightly south of the proposed drill site. Boats from the Morehead City area are likely to venture toward the Big Rock (Figure 1).

Recreational Uses

In addition to recreational fishing, which includes fishing from boats, the surf, and piers (both in the sound and the ocean), North Carolina's coastal

communities are characterized by a wide range of other recreational activities. Most are water dependent. This range includes swimming, sun bathing, hiking, camping, surfing, windsurfing, hang gliding, jet skiing, hunting, and visits to historic sites and parks, to name some of the most popular ones. These activities generate over a billion dollars in retail sales into Carteret, Hyde, and Pamlico counties where the seven selected communities are located. It is understandable, then, that potential sources of change would be of much concern, not only to the residents in those communities, but in the entire state as well.

Sociological Modelling of Community Structure

Sociologists and anthropologists have found it useful to examine community structure and variation in terms of conceptual models which, in turn, drive empirical research. Among the variety of models advanced, the most popular, historically, is that first described by Tonnies (Bassis *et al.*, 1991:567; Maiolo, 1989:95-96). The terms *Gemeinschaft* and *Gesellschaft* refer to community structures based on size, type of economy, relative homogeneity of values, and the use of traditions or formal laws for governance. In modern terms, a *Gemeinschaft* community is comparatively small and rural; its economy is based upon extractive production; there is little or no ethnic nor racial diversity; and while legal norms may exist, most behavior is based on traditional ways of doing things. Values are embedded in historical perceptions and traditions, and a relatively homogeneity of values pertaining to family life, work ethic, and community participation exists. In today's terms, a prototype *Gemeinschaft* community would be a small, isolated rural village, whose economy is based almost entirely on one of the extractive industries.

A *Gesellschaft* community is the polar opposite; the community is large and urban; ethnically and racially diverse, economic production is diverse and characterized by the domination of secondary (manufacturing) and tertiary (service) industries, and norms are almost exclusively based on formalized, legal codes. Values are diverse and, in some cases, conflicting. The prototype *Gesellschaft* community would be a large urban city like New York or Los Angeles.

Sociologists and anthropologists have assumed that in regard to the communities which fall within the polar types, the "variation between" types is greater than the "variation within." While this notion still prevails, Ellis (1986), in her studies of Chesapeake Bay communities, warns that the "variation within" creates enough behavioral and attitudinal differences to warrant caution in the characterization of community structure and functioning. With this as a backdrop, the remainder of the analysis of the study communities for this paper proceeded in the following manner.

Based on the data we gathered, the typing of the communities occurred as a relative comparison among the communities, rather than through a comparison

with an abstract model. This allowed us to develop a continuum on selected variables, rather than create an "either/or" division. Further, we shall use the term Type I to refer to that which might otherwise be labelled *Gemeinschaft*, and Type II for *Gesellschaft*. Communities which were found to fall in between on the variables we discuss below, we will label Mixed. An extensive comparison of variables (*e.g.*, race and ethnicity, employment configurations, etc.) can be examined in Volume I of the Final Report of the Study (East Carolina University and Impact Assessment, Inc., September 1993).

As one might expect, the Morehead City/Beaufort communities were judged as Type II on the basis of location, size and complexity and, in comparison to other communities in the study area. A reference back to Table 4 reveals that the respondents in those two communities identify "small town atmosphere" as an attribute. Does this create a problem for the typology? We would suggest that it does not for the following reasons.

First, as indicated above, the communities are typed relative to each other. Second, the admixture of economic activity in the area, along with the diversity of people (retirees, presence of diverse ethnic and racial groups, and the overpowering influence of tourism and political diversity) shapes the interactive mode toward a Type II (the first author, a sociologist, is a resident of Morehead City, and has studied the community for a period of 17 years).

Atlantic and Wanchese were determined to be Type I communities located in different parts of the study region but exhibiting similar dependence on fishing near the Manteo Prospect. Wanchese is located immediately on the coast with fishing effort directed locally and long distance. Some of the vessels fish near New Bedford, MA and/or the east coast of Florida. Most of Atlantic's vessels fish in the nearby sounds, but some fish near the Manteo Prospect as part of the winter trawl fishery. Also, some of the larger vessels travel to New England to participate in the groundfish and scallop fisheries.

The communities of Hatteras and Ocracoke are small and comparatively isolated, particularly during the "offseason." During the tourist season, however, these communities are bustling with diversity, with the visitors coming mainly from urban areas to the North. In searching for a conceptual handle on these communities, guidance was provided by a thoughtful paper by Marcus Hepburn, an Anthropologist who studied harvest and processing groups in the oyster fishery of northwest Florida. Hepburn (1976) observed that during times of expansion in the fishery, recruitment of employees extended well beyond traditional family and friendship groups. He used the term "fission" to label the process. During lean times, however, work groups contracted back to kin and friendship linkages, a process he labelled "fusion." We would argue that the same process occurs in coastal communities like Hatteras and Ocracoke, and thus provides us with an important example of a special type of coastal community, and one which other communities may emulate in the future as the

change process marches inexorably onward. Containing elements of both Type I and Type II communities, the argument is that the degree to which elements of each type prevail, is dependent upon the season of the year. From spring through Thanksgiving, with most visiting in the summer, tourists come from the highly populated northern communities of Virginia and Washington D.C. and the types of interactions in these two quiet villages of roughly 1700 and 700 are transformed into microcosms of a bustling metropolis—thus, fission. As winter approaches, the communities are reduced almost exclusively to interaction patterns found in Type I communities—thus, fusion. Because of these annual transformations, we label those two communities as “mixed.”

Still remaining is Nag’s Head, however, where the argument used in the discussion of Hatteras and Ocracoke might be applicable there. Despite it’s size, however, there is compelling evidence to categorize it as a Type II. First, it is dominated by tourism. Second, the types of housing development (and associated development planning processes which incorporate recreational activities such as golf into the planning process), sequenced influxes of retirees, and types of business (e.g., shopping centers) generate a context within which interaction patterns most characteristic of a larger urban area prevail.

Based on the discussion above, then, the continuum of communities, in terms of types, would be as follows:

TYPE I	MIXED	TYPE II
Atlantic	Hatteras	Beaufort
Wanchese	Ocracoke	Morehead City
Nag’s Head		

Effects of Community Structure on Perceptions and Attitudes

The focus now shifts to the differences community structure might create in regard to important attitudinal and perceptual issues. In this regard, we examine the most important issues of community concern, and sources of community change, both desirable and undesirable. It was during this phase of the data gathering process that respondents could incorporate their views on the prospect of oil and gas exploration in nearby coastal waters, along with other issues on their minds. It is important to note that the respondents were not prompted to discuss or evaluate OCS activities, but were given ample opportunity to do so if the issue were salient, either in a positive or threatening way to their communities.

The same 140 respondents were presented with an empirically derived set of cards identifying “risk items” that, if they were to occur, would change their communities. They were asked to sort and rank the items. Table 6 presents the results, viz., the top five risks for each community.

A word of explanation is required for the first item in Wanchese, "construction of jetties." Wanchese fishing vessels use Oregon Inlet as access to the ocean. It is a narrow and shallow inlet, with shifting sand bars, and it is dangerous. An accident occurs almost every year, and deaths are not uncommon. It is not uncommon, either, for experienced captains to run aground in the inlet, and simply await a rising tide for relief, while everyone on board hopes that the potentially dangerous winds hold off during the process (an experience the first author had on board a 144 foot trawler with one of the most seasoned captains in the area at the helm). Insurance companies charge higher premiums for vessels which use the inlet. Two fish houses based in Wanchese have opened satellite businesses in other states because of the uncertainty associated with navigating the inlet.

A major political battle has been raging for years as to how to stabilize the inlet, with jetty construction as the most popular one. Those who support that option claim that the economic benefits to the local area warrant the placement of the jetties. Virtually all Wanchese residents endorse the plan, and claim that the community's future is tied to it. Some scientists and active environmentalists strongly oppose such an option and have been successful to date in blocking the proposal before the U.S. Congress. Their argument is that stabilization is not possible, and any attempts at jetty construction will create other environmental and infrastructure problems—tidal flows will create unacceptable erosion, and the structural integrity of the Oregon Inlet bridge will be placed in jeopardy. For Wanchese natives, the choice of "construction of jetties" is interpreted to mean the lack of such construction will place the community's future at risk.

One of the surprising results in Table 6 is the lack of salience among the communities with respect to risks associated with possible OCS activity. A great deal was made out of the prospect of such activity in the coastal newspapers and television news reports, and was an issue in the 1992 Gubernatorial campaign. Yet the issue, expressed as "offshore oil drilling," made it to the top five risk items in only two of the communities (Wanchese and Beaufort). The other communities ranked is as follows: Nag's Head—8; Hatteras—8; Ocracoke—11; Atlantic—8; and Morehead City—9. Note that there is no pattern of ranking which relates to type of community.

The communities, however, did exhibit differences on the ranking of other risk items, and by type. For example, overdevelopment was ranked in the top five in each of the Type II and Mixed communities, and was buttressed by the Unplanned Development item in two communities (Nag's Head, Hatteras, and Ocracoke). Neither of those items was ranked in the top five in the Type I communities (Atlantic 7 and 15; Wanchese—9 and 16).

"Stricter fishing regulations" is seen as one of the top five threats to the community of Wanchese but not in the other communities. In-depth interviews with community residents by Belinda Blinkoff indicated widespread sentiment

that the regulatory framework favored recreational over commercial fishermen, and was a threat to their traditional way of life. Of particular concern were the regulations requiring the use of Turtle Excluder Devices (TEDs) on trawlers. An identical set of sentiments was found by Barbara Garrity-Blake in her ethnographic analysis of the second Type I community, Atlantic. Robert Blinkoff found the TEDs issue to be salient among the small number of commercial fishermen in Nag's Head (See Volume II, Community Studies, of the Final Report—ECU and Impact Assessment, Inc. September 1993, for the full discussion of the ethnographic studies of the seven communities).

The Type II and mixed communities expressed concern over environmental regulations as well, but in a different direction than that expressed in the Type I communities (see Table 6, Poor Management of Natural Resources, and Relaxing Environmental Regulations). With some exceptions, both Beaufort and Morehead City informants indicated concern for the lack of sufficient regulations in both the fisheries and community development, *i.e.*, regulations which protect water quality and adequately dispose of waste. Similar sentiments were expressed by respondents in the two Mixed communities of Ocracoke and Hatteras (see Table 6).

In order to further examine the community sentiments expressed in Table 6, two other statistical exercises were used, namely, Hierarchical Clustering, and Cultural Consensus Modelling. Hierarchical Clustering is used in conjunction with multiple dimensional scaling (MDS) in that it allows the researcher to identify pairs of items on an MDS plot and then merge items into clusters based on the degree of similarity. Therefore, it helps to explain groupings of items and dimensions as they appear on the MDS plots. The Cultural Consensus Model is used to examine the level of agreement among informants about their perceptions of the risk items by quantifying agreement across respondents through an item-by-informant matrix. The ratio between the first and second eigenvalue indicates the degree to which informants agree about the similarity of items.

Table 7 presents data from the two statistical exercises. Column two identifies items subjected to hierarchical clustering which identifies the most proximate pair of items on a multidimensional scale plot in terms of similarity. The progressive merging of other items into clusters is not reported. Column three indicates the level of consensus among the respondents in each community by reporting the ratio between the first and second factor eigenvalues. A ratio of 3 or better is judged to be indicative the assumptions of the model have been met, to wit, informants in the community agree about the similarity of items.

In the Type I communities, the following was discovered. In the village of Atlantic, the items with the highest degree of similarity in Table 7 did not square with the five highest risk items identified in Table 6. Both the Red Tide and Hurricane issues, however, are natural disasters and, in the past, have greatly

Table 6. Perceptions of risk/change agents; rank ordering of the top five by community type.

Community	Risk/Change Item
Type I	
Atlantic	Sewage Problems Farm Runoff Red Tide Too Many People Industrial Pollution
Wanchese	Construction of Jetties Hurricanes Stricter Fishing Regulations Offshore Oil Drilling Overfishing
Type II	
Nag's Head	Hurricanes Overdevelopment Sewage Problems Too Many People Unplanned Development
Beaufort	Overdevelopment Poor Management of Natural Resources Relaxing Environmental Regulations Offshore Oil Drilling Sewage Problems
Morehead City	Hurricanes Poor Management of Natural Resources Red Tide Relaxing Environmental Regulations Overdevelopment
Hatteras	Mixed Hurricanes Overdevelopment Poor Management of Natural Resources Unplanned Development
Ocracoke	Too Many People Overdevelopment Relaxing Environmental Regulations Construction of Bridges Unplanned Development Sewage Problems

Table 7. Results of hierarchical clustering and cultural consensus modelling.

Community and Type	Items With Highest Similarity	Ratio: Level of Consensus About Similarity of Risk
Type I		
Atlantic	Red Tide Hurricanes	4.029
Wanchese	Offshore Oil Drilling Construction of Jetties	7.533
Type II		
Nag's Head	Pave Roads Constr. Bridges	12.828
Beaufort	Relax Env. Regs. Poor Mgmt Nat. Res.	6.841
Morehead City	Pave Roads Const. Bridges Farm Runoff Ind. Pollution	3.609
Mixed		
Hatteras	Farm Runoff Ind. Pollution Unplanned Dev. Overdevelopment	15.042
Ocracoke	Farm Runoff Ind. Pollution	5.086

affected that community. Interesting, a fatalistic focus on natural disasters, out of the control of humans, is a characteristic of Type I communities. The cultural consensus statistical exercise produced eigenvalues of 6.630 and 1.645 for the first and second factors with a ratio of 4.029, which is labelled as High in Table 7, indicating community consensus.

In Wanchese, the two items with the highest similarity are among the five most important risk items identified in Table 6. The eigenvalues are 7.212 and 0.957, with a ratio of 7.533, indicating widespread consensus.

In regard to the Type II communities, Nag's Head's highest similarity items did not correspond with the five items listed in Table 6. In fact, those two items scored 14th and 10th in the larger list of risk items. These are items, however, that are not unrelated to overdevelopment, which ranked number 2 in the list in

Table 6. The eigenvalues were 8.209 and 0.640, with a ratio of 12.828, which is the second highest among all of the communities, indicating remarkable consensus.

In Beaufort, the data in Tables 6 and 7 are consistent. Eigenvalues produced a ratio of 6.841. Morehead City produced two sets of similarity items, and there is little correspondence with the rank ordering of risk items in Table 6. The ratio of the eigenvalues between the factors was a modest 3.609.

In the Mixed communities, Hatteras produced a modest degree of correspondence between the data in Tables 6 and 7. Four items clustered in the hierarchical clustering routine (Table 7). The eigenvalues of 9.180 and 0.160 produced the highest ratio between factors 15.042. In Ocracoke, the correspondence between the data in the two tables correspond only to the point that they are in the genre of pollution and environmental standards. Eigenvalues produced were 6.120 and 1.203, producing a ratio of 5.086.

DISCUSSION AND CONCLUSIONS

Each of the communities was chosen for study because of proximity to the Manteo Site and the expected patterns of use of water resources. Proximity is important not only because existing activities may be impacted by potential OCS activities, but because of an accident, such as an oil spill, or gas blowout. Each community, however, differs in degree and type of susceptibility to impacts.

Wanchese is not directly threatened by a spill event since it is situated behind the barrier islands which fence out the ocean. Yet, the dependence of the community on fishing in the area of the proposed drill site places it in the path of impacts should a spill occur, or should navigational changes be required near the site. The same is true for Atlantic. Nag's Head, Hatteras, and Ocracoke, in varying ways are less dependent upon commercial fishing, but could be physically threatened by an accident which could jeopardize the water dependent tourist industry. The Morehead City/ Beaufort area may be impacted insofar as the area could be the site of a landfall facility during the oil/gas exploration phase. The potential scope and variety of impacts, coupled with the expected salience of the issue because of the media exposure and the political rhetoric, prompted us to expect a high and uniform concern about OCS activity. In fact, this did not occur, as we discussed previously. The examination of the rank ordering of risk items, coupled with statistical modelling, indicated a uniformity of environmental concerns when respondents were prompted to evaluate potential change agents in their communities. We can label this a uniform environmental preservation ethic among the communities.

But the concerns were different in the different types of communities, supporting the notion that historically developed sociocultural contexts shape perceptions on environmental issues of immediate concern, and in specific ways.

In some cases, the concerns were in the opposite direction. For example, the Type I community of Wanchese finds the presence of fishing regulations as a threat, while the Type II communities find their absence to be a threat. What appear to be constant are the linkages between community economic pursuits and perceptions of risk. Further, the combination of statistical and ethnographic data reveal that fishermen tend to focus on one thing, regulation, regardless of community of residence.

An important conclusion one can draw from the findings is that some perceptions of risk to the environment are tied specifically to the cultural and economic frameworks of the communities. On the other hand, there is enough statistical evidence to indicate that other environmental concerns are present in all communities, regardless of type. In regard to the commercial fishermen's perceptions, the evidence is that the influence of the occupational subculture overrides community influence in the Type II and Mixed communities. Thus, heeding the warning of Ellis (1986), while there is value in typing communities in order to examine attitudes and behavior, communities with similarly looking social structures, in fact, can vary in their environmental outlooks, and subgroups within communities can exhibit tendencies more like their counterparts in other communities than those with other subgroups within their own.

Implications for the Gulf Region

As far as we know, there are no community studies from the Gulf Region to compare with the North Carolina study. However, there is a recently completed study by the first author, in conjunction with the Sportfishing Institute (SFI) which focused on the use of artificial reefs in both the Atlantic and Gulf regions of the United States (June 1992). Of particular interest here are the results of the study from the Gulf Region.

First, both commercial and recreational fishermen in each of the Gulf states (West Coast of Florida, Alabama, Mississippi, Louisiana, and Texas) fish near many of the several thousand oil producing platforms, estimated to be 3500 of the coasts of Texas and Louisiana alone. In some cases, up to 50% of commercial effort takes place near the platforms. In others, that type of fishing is seasonal or opportunistic. Second, fishing occurs for a wide range of finfish species among both commercial and recreational fishermen, and for shrimp among the commercial fishermen.

Interviews with 67 commercial and recreational fishermen by the first author indicated that platforms were considered to be productive fish attraction devices (FAD's) which accounted for the large amount of effort expended near them. The natural habitat involves the continental shelf ranging from 12 miles from the Mississippi River to nearly 220 miles off the West Coast of Florida. Artificial reefs, generally, and platforms, specifically, are considered to be

excellent fish gathering devices, and have been credited by the Gulf of Mexico Fishery Management Council with increasing the abundance of reef fishes (GMFMC, 1989). The practice of using platforms has become so popular that a "Rigs to Reefs" program has been put in place to officially convert and designate spent oil producing platforms as artificial reefs.

Negative comments were made, obviously, about the risks to the fishery resources should a spill occur, as has been the case in the past. Also, fishermen complained about entangling their nets on the platform. This problem is offset by the willingness of the platform owners to reimburse the fishermen for the damaged gear.

While offshore drilling is a major environmental concern in the Gulf, of more concern has been the conversion of shrimp trawlers to high rise bottom trawls, outfitted with roller sweeps, which are used over hard bottom (SFI, June 1992:18-19). This practice has been prohibited by the South Atlantic Fishery Management Council. Among the commercial fishermen, there is a uniformity of belief that federal regulations present the single most important threat to their livelihoods, a finding virtually identical to that which we found in the North Carolina community studies.

Results from the North Carolina research, and the limited data on artificial reefs from the Gulf indicate that studies similar to the North Carolina effort in the Gulf would be useful to a wide variety of agencies, not the least of which are the regional fishery management agencies. Insofar as the Gulf communities present a variety of sociocultural configurations and historical linkages with offshore drilling, research would not only facilitate the assessment of community impacts in the Gulf, but to present the possibility of viewing a presage of things to come in North Carolina. It would be useful, also, in order to allow potential community level perceptual and impact comparisons as a result of the significant difference in exploration and production technology. In the Gulf, for example, drilling occurs from platforms which extend upward above the water surface. It is expected that the North Carolina exploration would occur from an anchored drillship, but that production would occur from a submerged platform on the bottom.

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