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# A Study of Public Knowledge and Perception of the Effects of the "Argo Merchant" Oil Spill

A Technical Report by  
Peter Fricke  
and  
John Maiolo  
of East Carolina University  
to the National Oceanic and Atmospheric Administration

INSTITUTE FOR COASTAL AND MARINE RESOURCES TECHNICAL REPORT NO. 3

February, 1978

The research on which this Report is based was carried out by the Institute for Coastal and Marine Resources and the Department of Sociology and Anthropology at East Carolina University for the National Oceanic and Atmospheric Administration under Contract No. 03-7-022-35194

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by

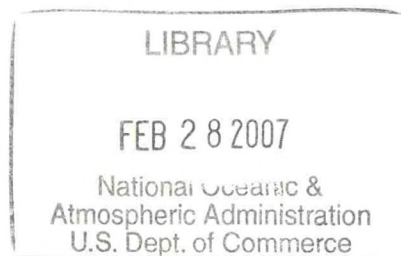
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Peter Fricke  
John Maiolo

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## Abstract

This study of public knowledge and perception of the Argo Merchant oil spill was carried out in October and November, 1977, i.e. between ten and eleven months after the spill occurred. In all, 308 residents of Chatham, Edgartown, Falmouth and Nantucket were interviewed by a research team from East Carolina University. Of these respondents, a special sub-sample of 48 were businesspeople, and almost uniformly they reported that trade in the first three-quarters of 1977 on Cape Cod and the Islands had either been as good as they had expected or better. This finding was borne out by the few socioeconomic indicators readily available at the time of the study. The conclusion reached by the researchers was that the Argo Merchant oil spill had little or no effect on the socioeconomic life of the region.

However, in a series of interviews with 260 other residents who had also been randomly selected, the perceptions of the effects were very different. In terms of knowledge of the oil spill and the events surrounding it, 69% of the sample were either uninformed or poorly informed, but 74% of the group believed that damage to the environment and the economy had occurred. Since the three major sources of information cited by the respondents were television, newspapers and radio, the research concluded that the information conveyed by these media had not been retained by more than two-thirds of the sample. An inspection of the data obtained by in-depth questioning revealed that the respondents, in spite of their lack of knowledge, took their perceptions of the adverse effects of the spill seriously. It is believed by the authors that knowledge of these perceptions needs to be incorporated into any efforts to inform the public and into any planning for prevention of or response to oil spills.



## Introduction

0.01 The tanker, Argo Merchant, grounded on the Nantucket Shoals on 15 December, 1977. The destruction of the vessel by heavy seas on the week following stranding and the release of her cargo of approximately 27,000 tons of Number 6 residual fuel oil were the subjects of considerable public debate and media coverage.<sup>1</sup> In particular, estimates of the damage which could occur were widely circulated as public officials in Federal, State and Municipal Government sought assurance of aid from President Ford and the Federal Government.<sup>2</sup> Thus, an article in the Christian Science Monitor noted that the loss of income to fishermen in five Massachusetts coastal towns could amount to \$27.6 million, with a further possible loss of \$83 million to fish processing and marketing companies.<sup>3</sup>

0.02 Fortunately, none of the oil spilled by the Argo Merchant appears to have drifted ashore, and the cost of the response to the accident is estimated at \$2.7 million<sup>4</sup> to date. This does not include the costs of any possible damage to the fishery since this cannot be determined until statistics for the 1977 year-class are gathered by the National Marine Fisheries Service in the next two or three years. It is possible that even when these statistics are available, it will be difficult to isolate the impact of the Argo Merchant oil spill from the effects of the extremely cold winter and spring of 1976-1977.<sup>5</sup>

0.03 The study described in this report was undertaken during the autumn of 1977 in an effort to determine whether the general public had any opinions about the oil spill and its effects, whether the oil spill was perceived to have had any adverse impacts on the lives of those living on Cape Cod and the islands of Nantucket and Martha's Vineyard, and finally to ascertain the opinions of those interviewed about the responses of government and industry to oil

spills. To ensure as broad a cross section of the public as possible, a random sample was drawn up (see Appendix I - Note on Methodology) and in all 308 persons were interviewed in Chatham, Edgartown, Falmouth and Nantucket. The composition of the sample is shown in Section 4 of this report. In Sections 1 and 2 the economic base of the area is discussed and information is presented concerning the principle industries, tourism (Section 1) and fisheries (Section 2), and an assessment of their performance in the first three quarters of 1977 relative to previous years. In Section 3 an analysis is made of the information available to residents of Cape Cod and the Islands in the local press during the first nine months of this year concerning the Argo Merchant and other oil spills.

0.04 The responses of those interviewed are shown in Sections 5 and 6. Section 5 deals with the quality of the knowledge shown by respondents, while Section 6 treats the ideas put forward by those interviewed about the effects of, and response to, the oil spill. In their comments many respondents also discussed issues which were not covered directly by the terms of the grant from NOAA. However, since these issues were seen by the respondents as being related to oil pollution, they are discussed in Section 7, and include topics such as the treatment of sewage and exploration for oil on the Georges Bank. Section 8 summarizes the findings of the study.

## Footnotes

1. See, for a description of press coverage, Peter H. Fricke: A Catalog of Press Clippings Relating to the "Argo Merchant" Oil Spill; Woods Hole Oceanographic Institution/NOAA Contract 01-7-022-12382; August, 1977.
2. See, e.g. the Boston Globe, Boston Herald American and Cape Cod Times of 23 December, 1976.
3. Ward Morehouse III: "Fishing, tourism expect oil blow" in Christian Science Monitor; 23 December, 1976.
4. George Adams: "Landmark bill on oil spills" in Vineyard Gazette; 20 September, 1977.
5. See, e.g. Valley Advocate, 5 January, 1977; Cape Codder, 6 January, 1977; Falmouth Enterprise, 7 January, 1977.

Section 1: Cape Cod and the Islands: "An unrivaled vacation-land"

1.01 The people of four towns - two of which lie on Cape Cod, and one on each of the islands of Martha's Vineyard and Nantucket - were the resources for this study. While the individuals were selected at random (see Appendix 1), the towns were not; the authors wished to study communities that were representative of the social and economic ways of life in the region. Each of the towns there has a strong commitment to the tourist trade or vacation industry. Two of them consider themselves to be fishing towns, although commercial and recreational fishing are carried on in all of them. And finally, to assure proper representation with the research design of individual responses, they all have a population of approximately 3,000.

1.02 The communities that met these criteria were Chatham, at the southeastern tip of Cape Cod, and Falmouth Center, in the southwestern corner of Cape Cod. On Martha's Vineyard, Edgartown was selected while Nantucket Island was chosen as a whole, although the sample was concentrated in Nantucket Town and Madaket. Of these communities, only Falmouth Center was not a geographic entity. Falmouth is a town which embraces eight villages and had a population of some 20,650 at the time of the 1975 census. Falmouth Center abuts the other villages, and frequently it is difficult to tell where one ends and another begins. For the purpose of this study, we assumed Falmouth Center to be that area included in Precinct 2 of the Township of Falmouth.

1.03 The principal industry of all four towns in 1976 and 1977 was tourism. Barnstable and Dukes Counties, which embraces Cape Cod and Martha's Vineyard, rely on travellers for an estimated 75 to 80% of their overall economy.<sup>1</sup> As can be seen from Table I-1, visitors to the region spent nearly \$341 million in 1975, and over \$301 million in 1976, on lodging and services. These travellers -

Table I-1: Expenditure by travellers to Cape Cod, Martha's Vineyard and Nantucket in '000s of dollars.

	Cape Cod*	Martha's Vineyard**	Nantucket	Total for region
1975				
Winter	37090	840	811	38741
Spring	77023	3543	3136	83702
Summer	147262	10155	6483	163900
Fall	50811	1928	1791	54530
1975 Total	312186	16466	12221	340873
1976				
Winter	29323	724	918	30965
Spring	65479	3888	3864	73231
Summer	143739	9830	8105	161674
Fall	32212	1746	1582	35540
1976 Total	270753	16188	14469	301410

\*Barnstable County      \*\*Dukes County

(Information from: N.G. Courmoyer & J.K. Kindahl: Travel and Tourism in Massachusetts, 1976, University of Massachusetts, Amherst; 1977.)

seasonal homeowners, businessmen and tourists - were estimated to have spent as much or more in 1977 than the amount in 1975 by businessmen and hoteliers. The drop in receipts in 1976 is attributed by businessmen and officials of their organizations to bicentennial activities elsewhere in the United States which attracted both seasonal residents and tourists.

1.04 These trends are reflected in Table I-2 which shows the number of passengers carried by the Woods Hole, Martha's Vineyard and Nantucket Steamship Authority. In the first three quarters of 1977, the number of passengers carried is significantly higher than in previous years, in spite of the severe weather in January and February when sea ice interfered with ferry operations. While the passenger statistics of the state-controlled Steamship Authority are readily available, the three privately operated ferry lines were not prepared to disclose the volume of traffic carried. These companies, Cape Island Express Lines, which serves Vineyard Haven from New Bedford, Hy-Line operating from Hyannis to Nantucket and Martha's Vineyard, and the Island Queen from Falmouth to Oak Bluffs, are seasonal ferries. It would appear, however, from information given by dockside businesspeople and crew members who were interviewed as part of the randomly selected sample, that the volume of traffic carried on these vessels was also higher in 1977 than in previous seasons.

1.05 Chatham was the only town of the four which was not in some way directly involved in the Argo Merchant oil spill response by state and federal agencies. Nantucket saw a great deal of activity, during the latter part of December, 1976, and much of January, 1977, as the forward base for teams working at the wreck site. Edgartown was marginally involved through the activities of the oiled-bird cleaning center established at the Felix Neck Wildlife Sanctuary. However, it must be noted that the residents of Nantucket and Edgartown also had

Table I-2: Passengers carried by the Woods Hole, Martha's Vineyard and Nantucket Steamship Authority between Cape Cod and the Islands.\*

	1972		1973		1974		1975		1976		1977	
	No.	%†	No.	%†	No.	%†	No.	%†	No.	%†	No.	%†
January	23,328	100	27,063	116	25,879	111	28,231	121	28,594	123	22,956	98
February	22,205	100	27,803	125	24,343	110	29,574	133	35,044	158	26,299	118
March	30,360	100	36,878	122	36,919	122	40,947	135	37,591	124	36,011	119
April	52,655	100	63,483	121	61,300	116	57,553	109	73,139	139	72,666	138
May	77,999	100	82,267	106	90,428	116	100,039	128	104,220	134	117,790	151
June	125,414	100	133,479	106	133,759	107	154,731	123	156,803	125	160,371	128
July	220,638	100	213,085	97	226,608	103	263,809	120	258,988	117	298,893	135
August	260,421	100	265,326	102	279,059	107	312,548	120	292,025	112	329,170	126
September	128,997	100	145,969	113	132,064	102	144,896	112	157,570	122	169,185	131
Totals	942,017	100	995,353	106	1,010,359	107	1,132,328	120	1,143,974	121	1,233,341	131

\*Statistics supplied by the Woods Hole, Martha's Vineyard and Nantucket Steamship Authority.

† Percentage of traffic carried in 1972.

an involvement in the Argo Merchant incident in that their beaches were the ones that would probably have been oiled by the slick from the wreck had it come ashore. Falmouth Center residents were involved in the Argo Merchant spill in that many of them worked for the marine science laboratories, federal and private, at Woods Hole. The headquarters for the spill response was at the Otis Air Force Base/ Coast Guard Air Station, situated on the northern boundary of Falmouth township. The Bouchard 65 spill response was also coordinated from Otis and affected the towns of Bourne, Falmouth and Wareham. All three towns border Buzzards Bay.

1.06 Nantucket has the most completely maritime economy of the towns in this survey. While it has an active airport with scheduled flights from the mainland, it relies on the Woods Hole, Martha's Vineyard and Nantucket Steamship Authority for its primary links with the rest of the United States. The port facilities at Nantucket Town, and the sheltered anchorages and piers of Nantucket Harbor and Madaket Harbor, provide a good base for a thriving fishing industry. They also provide for the needs of tourists and visiting (and resident) yachtsmen, as well as symbolizing the ambience of the Island. The seas around Nantucket offer good fishing for the recreational fishermen, particularly for bass, bluefish, and white and yellow perch. The marine resource is important to Nantucket's economic well-being.

1.07 The tourist industry, the mainstay of the Island's economy, differs from that of the other towns in the study however. Nantucket Island is a Historic District as defined in the laws of the Commonwealth of Massachusetts. This designation has resulted in a positive attitude towards land-use which has curbed the sub-division of the Island and, through the Nantucket Conservation Foundation, has placed large portions of the land-area of the Island and town into public trust. This process was further hastened by the decision of local businessmen, encouraged



and supported by Walter Bienecke, Jr., to reconstruct Nantucket Town and its waterfront to provide both "an as-good-as-they-come reconstruction (which Bienecke compares to Williamsburg, Virginia, and Ford's Dearborn Village in Michigan) and a viable shopping center."<sup>2</sup> This exercise took place because Bienecke and other residents, summer and year-round, felt that the only way for the Island to have a viable economy and retain its principal resources undamaged was to seek the "better" tourists. By "better" is implied the idea that tourists coming to the Island should not be "day-trippers," but rather spend their money on longer stays. The Chamber of Commerce puts another view point obliquely when it states in its guide-book: "A cancelled reservation means lost business since Nantucket, being an island, and unlike mainland vacation areas, cannot depend upon transient business."<sup>3</sup> While the Hy-Line seasonal ferry to Hyannis from Nantucket caters largely for "day-trippers" (in both directions), their short stay on the Island does not have any great impact other than in the shopping and business area adjacent to Nantucket Harbor. In their three or six hours ashore, few stray into areas where they would impinge on the activities of longer term visitors and residents.

1.08 In consequence then, the residents of Nantucket were understandably concerned in December, 1976, when it appeared that Argo Merchant oil might wash up on their beaches and interfere with their fishing activities. Oil and vacations are not seen to mix well. Several hoteliers and businessmen reported that summer residents had telephoned to ask what was happening on the Island during the period of media coverage of the oil spill. However, the spill appeared to have receded in the memories of visitors: "No one asked me about the spill this summer; they only wanted to talk about the fantastic fishing." (Owner, fishing tackle shop.) "I had a very good year. . . During the summer we had guests

crawling out of the woodwork. Normally we are full all the time in summer and most of the guests are 'steadies' who come back each season for two or three weeks or a month." (Guesthouse owner.) But the same guesthouse owner also said that: "The \_\_\_\_\_ (name of guesthouse) could probably weather an oil spill on the Island and its bad publicity for two years or so. . . This is not true of some of the others though. . . many of the guesthouses would fold after one bad season because you can't make enough unless you are full to carry you through the winter."

1.09 The consensus of the businesspeople interviewed on Nantucket was that the 1977 season had been a good one. Most of those interviewed felt that it was as good as, or better than, that of 1975. One or two hoteliers felt that the summer was not as good, generally, as 1975 however: "I did very well this season, but one or two of the other guesthouses had empty beds." And another said: "I think the trade was lower in 1977 than in '75. In '75 you couldn't find a parking place anywhere, but this year you could find one if you looked for a bit." Tackle and bait shops did a thriving business, and the restaurants also had a good year: "Trade has been up this year, better than '76 and above '75. We cleared enough so that we can finally remodel the kitchen and store rooms, and afford to close down for a couple of weeks in February." (Restaurateur.)

1.10 Several of the businesspeople interviewed noted that the business had probably been better because of the oil spill: "We had lots of free publicity, and I think that people suddenly realized that we were accessible." (Restaurateur.) "While the clean up crews were here, the house was full. It was the best winter any of us have had." (Guesthouse owner.) "All these people came here in city suits and street dresses, you know, like this was New York and Boston. I cleared my shelves of rainwear and slickers, and we got rid of stock

that had been accumulating in the backroom for years. Never thought I would sell a purple and orange woolen sweater, but it went because it was the only one of its size left on the Island." (Clothing store owner.) "They all wanted photos of the wreck, you know, but the Coast Guard wouldn't let them fly over it so they chartered my boat, cash down. Well, you know the weather then, you (Dr. Fricke) were here; nothing went out for days at a time offshore. The upshot was I got paid for six days and only went out once, and the Vigilant saw us off there, so they didn't get no photographs." (Charter boat owner.)

1.11 Edgartown is also an island community offering beaches, good sailing and fishing, and a picturesque town center. The Chamber of Commerce views Edgartown as ". . .the Vineyard's most elegant community, was the island's first white settlement, and has been the county seat since 1642. The stately white Greek Revival houses built by the whaling captains have been beautifully kept up, and they make the town a museum-piece community, a seaport village preserved from the nineteenth century."<sup>4</sup> The town of Edgartown has 2,128 year-round residents, and sixteen hotels, guesthouses, motels and inns to serve its share of summer visitor population estimated by the Chamber of Commerce to be 700,000. While not all of these visitors to Martha's Vineyard will travel to Edgartown, and many will stay in summer homes, it must be noted that Edgartown is first and foremost a tourist dominated community. Thus, it boasts, in season, five antique stores, three art galleries, seven gift shops, twelve realtors and fifteen restaurants and cafes.

1.12 Edgartown, originally an area of summer and retirement houses, participates in the transient and day tourist activities of Martha's Vineyard. Ease of access from New Bedford, Falmouth, Hyannis and Woods Hole by ferry, and the wider variety of activities available to tourists because of its relatively large

size when compared to Nantucket, have led to a booming tourist economy directed towards mass tourism. This variety has impinged upon Edgartown and many of the businesspeople interviewed commented on the changes, seen as adverse, caused by short stay visitors and noted the benefits of Nantucket's policy of encouraging the "better" tourist. However, there was a feeling among the majority of those interviewed that, even if Argo Merchant oil had come ashore, there would have been little effect on the summer season of 1977. It was noted, however, that if the spill had occurred in the late or early summer, the tourist trade would have been severely impacted.

1.13 The summer of 1977 was a good one for nearly all the businesspeople interviewed. "We had all our regulars back this year, and there were only a couple of nights when we turned people away." (Hotel owner.) "The extended fishing Derby turned out to be a good thing. I was opposed to it when Hull (Executive Secretary, Martha's Vineyard Chamber of Commerce) talked about it, but it worked and I had a better season than before. The fish were biting and the people never seemed to stop coming." (Sportsgoods store owner.) "1977 has been a good year for us. We do three-quarters of our trade in the season, and we've done very nicely this year. . .The oil spill? Well, nothing seems to keep the tourists away from here." (Pharmacist.) "It hasn't been such a great year as others may have told you. In this business (antiques) you need the customers with the fat pocketbooks who will buy big pieces. The day trippers coming to Chappy Ferry aren't going to buy anything but trinkets, and they are driving the people who would buy good stuff away." (Antique store owner.) "I don't think oil spills really have any affect on our business. People come to Martha's Vineyard because its quiet, has character and they can get away from their offices and businesses. We did marvelously this summer, and no one talked about the spills.

I mean, they are commonplace here." (Art gallery and gift shop owner) "There wasn't a night in July and August that we were not booked up three days in advance. It was a great season, and I look forward to a rest in Florida in January." (Restaurant owner.)

1.14 Falmouth Center is part of the Town of Falmouth. For the purpose of our study we interviewed persons living in Precinct 2, which includes the old village of Falmouth, public and private beaches and the western shore of Falmouth harbor. The League of Women Voters describes Falmouth as follows: "Geographically and historically there is one Falmouth, but to its people there are two: the year-round cluster of Cape Cod villages and the summer resort community. Although the distinction is getting blurred as more and more summer people become year-round residents, it is the interaction between the two that account for much of the special nature of the town."<sup>5</sup>

1.15 The most important industry in Falmouth is tourism and the service industries related to it including construction. The population is able to support major year-round retailing enterprises and the majority of these are located on or near Main Street in Falmouth Center. There is a diversified economy and thus the ebb and flow of population seen in Nantucket and Edgartown is not so pronounced in Falmouth Center. Most of the businesspeople interviewed felt that between one-third and one-half of their income came from summer (seasonal) trade in contrast to the Island communities which reported that between two-thirds and all their income was seasonal.

1.16 Trade in 1977 was seen as being as good as or better than other years by most of those interviewed. "We sold as many boats this year as we did in 1975, and business generally was real good." (Marine operator.) "Its been a good year for here. This is a new restaurant, but from our experience elsewhere, I would say

that we exceeded our expectations by 50%." (Restaurant owner.) "There's been a demand for everything. Our rental bikes (bicycles) were in use every day, people were buying up things for their cottages, and the tackle side has done well. I'd say that we grossed 10 or 15% over previous years. . .The oil spill? Well, that's been good business too. People have to eat and they need odds and ends of gear. Even the politicians did well out of it, although they looked a bit stupid when nothing happened." (Hardware store owner.) "There wasn't a bed vacant any night between July 4 and Labor Day, so I suppose you could say business was good." (Motel owner.) "No, the oil spill didn't hurt us. We were full every night of the week during the season, and we did very well in the winter and spring too." (Restaurant owner.)

1.17 Chatham is a fishing and farming community that has been taken over by the tourist industry. The town has splendid natural harbors, sheltered like those of Nantucket by sand spits, and access to Pleasant Bay to the north, the Atlantic to the east and Nantucket Sound to the south. Monomoy Island adjoins Chatham, and the Cape Cod National Seashore runs along the eastern shore of Pleasant Bay. Fishing is still an important industry, and there are five fish and seafood wholesalers in the town buying from local craft, the same number in fact as in Nantucket. Chatham has a high proportion of residents who have retired to the area, usually to summer homes used by them in earlier years, and its development is spread along the major approach roads to the town center. The transient visitor, usually touring Cape Cod and on his or her way to or from Provincetown, is a major source of income to the town's businesses.

1.18 "Business has been good this year. Property has been snapped up as soon as it comes on the market, and rentals have gone well. A lot of our clients come down from Canada - they think its warm here - and we could have sold twice

the number of homes. . .The oil spill? No, that doesn't make any difference here. Land is scarce and property values just keep on going up. People see this an an investment." (Realtor.) "We sell a lot of Sandwich glass in our own mountings and we can't keep up with demand. Passersby come in and then they come back two or three or four weeks later when they come down to the Cape for the day again." (Antique store owner.) "In this business we have a lot of problems estimating demand. This year the demand has been for leather clothing and we've sold out twice. The workshop (in the back of the store) can't keep up, and we're still shipping out orders from September; its been a fantastic year." (Leather and crafts' store owner.) "Business has been better than I expected." (Fishing tackle shop owner.) "It's been much better than 1975 this year. I don't think we've turned off the no-vacancy sign once in the season." (Motel owner.)

1.19 In summary then, the indicators for the economy of the Cape Cod and the Islands in the ten months following the oil spill from the Argo Merchant do not show any adverse affects. Our sample of 48 businesspeople were also enthusiastic about the summer trade and the majority (37) felt that business was as good as or better than 1975, the previous record year in the tourist industry. Of the eleven respondents remaining, three were owners of new businesses and were unable to make a comparison with earlier years, although all three said they had done better than expected. Of the remaining eight businesspeople, only two said that their business had declined because of the oil spill. One Chatham man had suffered because of a shortage of lobsters in December, 1976 and January, 1977, for his fish wholesale business (the Coast Guard closed some of the traditional fishing to vessel traffic) and the other businessman felt people had stayed away from Edgartown "because of the bad publicity." Of the other six businesses

(two antique dealers, an art gallery owner, a restaurateur, and two hoteliers), the primary reason given for a perceived decline in their business was the changing pattern of tourism on the Cape and Martha's Vineyard from visitors who stayed for two or three weeks to day trippers.

1.20 In the random sample, sixty-five business proprietors were included among those interviewed. Of these, fifty-four percent of the businesses were seasonal, i.e., tourist oriented. In Edgartown 82% of the proprietors sampled had seasonal businesses; in Chatham, 64%; 50% in Nantucket; and 38% in Falmouth. This reflects the patterns we have described earlier. Sixty percent of those 65 proprietors indicated that 1977 had brought about the usual number of tourists, in their view. Thirty percent indicated that the number of tourists had been greater than in previous years, while only ten percent felt it had declined. As far as their own businesses were concerned, fully 92% of the 65 proprietors indicated that 1977 was the same (35%) or better than (57%) previous years.



## Footnotes

1. Norman G. Cournoyer and James K. Kindahl: Travel and tourism in Massachusetts, 1976: An economic analysis. Amherst: University of Massachusetts; 1977.
2. Anne W. Simmon: No Island is an Island. Garden City, N.Y.: Doubleday; 1973. p. 185.
3. Edouard A. Stackpole: Nantucket. Nantucket, Mass.: Nantucket Island Chamber of Commerce; no date. p. 20.
4. Janice Hull and Thomas E. Norton: Martha's Vineyard: A visitor's guide. Vineyard Haven, Mass." Martha's Vineyard Chamber of Commerce; 1976. p. 51.
5. Anonymous: Falmouth in Focus. Falmouth, Mass.: League of Women Voters; 1976. p. 8.

## Section 2: Fisheries

2.01 The fishery on the Georges Bank is one of the most productive in the world. In 1976 approximately 32% of all the commercial landings by weight on the U.S. Atlantic coast were made in New England. The value of the catch was approximately 45% of the value of catches on the Atlantic coast. Of all U.S. commercial fisheries, the landings in New England represent approximately 40% of the total weight caught and 13% of the total value.<sup>1</sup> It must be pointed out that these statistics do not include the value and tonnage of the catches made off New England by other foreign fleets.

Table 2.1: New England commercial landing, by weight and value\*

	Weight ('000 pounds)	Value ('000 dollars)
1974	521,565	121,843
1975	497,483	149,692
1976	544,199	175,436

\*Information from: U.S. Dept. of Commerce, NOAA, NMFS: Fisheries of the United States.

2.02 The share of this catch landed by the fishermen of Massachusetts and Rhode Island is considerable - approximately two-thirds by weight and value. The importance of this fishery to the area economy of the Cape Cod region was estimated by the Commonwealth of Massachusetts to be \$27.6 million in 1976. Equally important to the local economy are the industries, processing, transportation and merchandising, associated with the fishery. For the Cape Cod region this economic input has been estimated to be \$83 million for 1976.<sup>2</sup> The distribution of the landings in 1975 and 1976 is shown in Table 2.2. Data for landings at individual ports on Cape Cod and on the Islands of Nantucket and Martha's Vineyard was not available to the researchers. However, port landing statistics can be misleading,

Table 2.2: Commercial landings of fish in Massachusetts and Rhode Island\*

	1975		1976	
	'000 pounds	'000 dollars	'000 pounds	'000 dollars
Boston	24,468	6,262	23,300	6,800
Gloucester	126,419	14,504	144,200	16,500
New Bedford	68,640	31,283	64,900	39,200
Newport	16,925	7,654	23,600	10,000
Point Judith	54,310	6,482	46,800	6,600
All other R.I.	8,102	4,652	1,232	3,810
All other Mass.	50,325	26,421	56,118	35,105
Total R.I.	79,337	18,788	71,632	20,410
Total Mass.	269,952	78,470	288,518	97,605
TOTALS	349,289	97,258	360,150	118,015

\*Information from U.S. Dept. of Commerce, NOAA, NMFS: Fisheries of the United States.

since fishing vessels are able to land their catches at the most convenient dock and do not necessarily land at their home port.

2.03 A further important use of the fishery is that of recreational fishing. It was estimated by the National Marine Fisheries Service that some 2,582,000 persons engaged in marine recreational fishing in Massachusetts and Rhode Island during a twelve-month survey in 1973-74.<sup>3</sup> The growth of the marine recreational fisheries in the United States since 1950 has been large. The estimates of this growth for the Atlantic region between 1955 and 1970 are shown in Table 2.3. However, these fisheries are not just used by local residents for their own enjoyment. The recreational fishery draws participants from throughout the northeast

Table 2.3: Marine recreational fisheries on the Atlantic coast of the United States by estimated number of fishermen, expenditure and weight of landings.\*

	Fishermen ('000s)	Expenditures ('000 \$)	Landings ('000 lbs.)
1955	2,343	213,653	(No survey in 1955)
1960	3,383	346,373	731,852
1965	4,178	331,179	836,481
1970	5,010	636,380	917,631

\*Information from U.S. Dept. of Commerce, NOAA, NMFS: Fisheries of the United States.

of the United States and in consequence plays a major part in the tourist or vacation economy. Table 2.4 indicates the scope of this participation, and further underlines the importance of the marine environment to the social activities of the region.

Table 2.4: Estimated number of people participating in marine recreational fishing in Massachusetts by north-eastern state of residence: June, 1973-June, 1974.\*

Connecticut	94,000
Delaware	5,000
Washington, D.C.	2,000
Maine	7,000
Maryland	16,000
Massachusetts	1,300,000
New Hampshire	36,000
New Jersey	98,000
New York	271,000
Pennsylvania	83,000
Rhode Island	61,000
Vermont	10,000
Virginia	14,000
West Virginia	3,000
TOTAL	1,998,000

\*Information from U.S. Department of Commerce, NOAA, NMFS: Fisheries of the United States.

2.04 The ocean is large, but the Georges Bank provides the resource for 85% of Massachusetts fish catches and nearly 15% of the world's catch by value.<sup>4</sup> The combined use of the fishery resource, commercial and recreational, off Cape Cod, Martha's Vineyard and Nantucket is a major economic and social factor in the life of the region, but one which is difficult to quantify accurately. In the concern for the fishery following the Argo Merchant, attention was initially directed towards the commercial fish stocks. However, the recreational fishery - an aspect of the tourist and vacation industry - would have been severely affected also had the oil come ashore or the spill have occurred during the vacation season. For this reason the authors interviewed fishermen and persons associated with the fishery.

2.05 The effects of the Argo Merchant oil spill, in the short term, on the fishery appear to be minimal. Long term stock assessments must wait, however, for further surveys during the next four or five years by the National Marine Fisheries Service. It must be noted, however, that the opinion among scientists is that even then the effects of the spill will not be accurately known because of the abnormal winter of 1976-1977. In a report by Development Sciences, Inc. to the Office of Technology Assessment of the U.S. Congress,<sup>5</sup> a survey of commercial fishermen showed that the Argo Merchant spill had had no effect on the fishing industry. While some lobster fishermen encountered concentrations of oil 120 miles southeast of the wreck at the end of January, catches of finfish and lobsters were reported as normal, and there was only one report of a haul of oiled scallops. (The tow had been made in an area close to the wreck while pancakes of oil were present.) Importantly, the fishermen reported that no oil had been encountered on the sea bottom during trawling and lobster fishing operations.

2.06 These findings were borne out by studies carried out by the National Oceanic and Atmospheric Administration in the months immediately after the spill.

Although a few samples taken by National Marine Fisheries Service during a research cruise in the first two weeks of January, 1977, showed that some fish had ingested oil, no other reports of oiled fish were made. However, some forms of fish larvae and eggs were shown to have been affected, and it is the measurement of this effect which will be determined in the long range studies planned for the next four years.<sup>6</sup>

2.07 The comments of the commercial fishermen to our interviewers are instruction in this regard:

"I have been lobstering, sport fishing and scalloping and have seen no effects" (Nantucket fisherman).

"Fortunately or unfortunately, tidal currents and prevailing winds carried the oil away. There were no effects" (Nantucket lobsterman).

"The effects were positive for me - took trips out on my charter boat to the spot; there was a curiosity factor to the spill and the fishing was good anyway there" (Nantucket fisherman).

"No effects. The scalloping was good this year. The other fishing was good, but not as good as previous years, but it has nothing to do with the spill. There has been a gradual decline in fishing for years" (Nantucket fisherman).

"We had a good year this year. Market was up and there were fish everywhere" (Chatham dragger owner).

"Can't complain about the fishing. Anyway, they (the fish) don't seem to mind the oil and there's been enough spilled off here since the 20's, so they should know! Always used to use a brick dipped in oil in the lobster pots and they'd climb in - they liked it so" (Chatham fisherman).

"The fishing in the Sound has been declining for a long time, but that's because all these tourists and summer people put out their pots and dump their garbage. The lobstering's still good on the banks, though, and I've done okay this year" (Edgartown fisherman).

"It's been good fishing this year. The spill hasn't seemingly touched the fish, but that's because it went out to sea and was in winter" (Falmouth resident who fishes from New Bedford).

2.08 In all, twenty-two commercial fishermen were interviewed for this study. The range of species for which they fished included cod, lobster, bluefish, haddock,

flounder, mackerel, clams, scallops and eels. Only two of these fishermen indicated to interviewers that the 1977 season was worse than previous years, and both men attributed this in the main to over-fishing. Two other fishermen said that their fishing results were comparable to other years, while eighteen fishermen reported that their fishing had been good or excellent in comparison to other years.

2.09 The commercial fishermen attributed most of the improvements in fishing to "natural" forces, for example, the use of better seed scallops, fish migration closer inshore, and good weather for much of the year. Only one fisherman reported that the use of improved fishing gear was the reason for a successful year. The only oilspill related damage to fishing gear reported was to lobster pots. But in this case no real economic loss was suffered, since the fishermen concerned also reported the year as being good in comparison with other years. One fisherman reported seeing dead fish close to the spill site, while ten fishermen reported seeing dead birds at sea.

2.10 Over a hundred respondents reported that they took part in recreational fishing. Nearly three quarters of this subsample perceived the 1977 season as being the same as or better than previous years. Of those who indicated that the fishing was worse during 1977, many commented that "natural" factors were operating. Oil spills were blamed only for poor fishing in Vineyard Sound, and here the affected fishery was the shell fishery, where spills prior to that of the Argo Merchant had closed the fishery. It must be noted here that the bluefish fishing tournament, run annually by the Martha's Vineyard Chamber of Commerce, had its best year ever in 1977. The catches were higher than in any other year.

2.11 In conclusion then, the circumstantial evidence is that the commercial and recreational fisheries were not affected by the Argo Merchant oil spill in 1977.

However, it must be noted that many of the fishermen interviewed felt that was because of offshore winds and currents and the fact that the spill had occurred in winter.



## Footnotes

1. U.S. Department of Commerce, NOAA, NMFS: Fisheries of the United States, 1976. Washington, D.C.: U.S. Department of Commerce; 1977.
2. Christian Science Monitor. December 23, 1976.
3. U.S. Department of Commerce, op. cit.
4. Press statement by Dr. Evelyn Murphy, Secretary of the Department of Environmental Affairs, Commonwealth of Massachusetts; 29 December, 1976.
5. Development Sciences, Inc.: "The contribution of fishing industry knowledge toward assessing the effects of the ARGO MERCHANT oil spill." Mimeo: Draft report submitted to the U.S. Congress Office of Technology Assessment (Oceans Division); May, 1977.
6. National Oceanic and Atmospheric Administration:

### Section 3: Information available in the local press

3.01 The press plays a major role in forming public opinion and, for this reason, an analysis was made of the news items appearing in local newspapers in the first months of 1977. While it can be argued that radio and television provide much of present day home entertainment and are considerable forces in molding public opinion, local newspapers provide fora for local news and comment that cannot be rivaled by the other media.

3.02 Cape Cod and the Islands are served by several local newspapers. Perhaps the best known of these is the Vineyard Gazette published on Martha's Vineyard. Published weekly, it has an influence and readership far beyond the Island since many summer residents subscribe to the newspaper. On Nantucket, the Inquirer and Mirror is also published on a weekly basis. The Falmouth Enterprise is published biweekly, and serves much of Upper Cape Cod. The Cape Cod Times is published daily, and is read throughout the Cape. The Standard-Times is also published daily, but is based in New Bedford. In consequence, it has a lower proportion of the readers in the area studied, but was referred to by many of the fishermen as being a principal source of information. Since New Bedford is a major industrial fishing port, the Standard-Times carries fish market prices and other items of concern to the fishing industry. Other newspapers available and read throughout the Cape and Islands include the Cape Codder, published weekly, Boston Globe, Boston Herald American, Christian Science Monitor, New York Times and the Wall Street Journal. In a few of the newstands visited the Providence Journal was also displayed.

3.03 The grounding and wreck of the Argo Merchant was a national news item, and it was covered extensively in the press. The Bouchard 65 oil spill, on the other hand, was not sufficiently newsworthy to attract more than passing comment

from the Boston, New York and Providence newspapers. For the local newspapers it was the source of considerable news stories in February and later in the year as the extent of damage to the shellfish beds was discussed.

3.04 At the time of the Argo Merchant spill and in the last two weeks of December, 1976, stories about the wreck, the need for legislation, the impact of oil on the marine environment, and the possible effects of the spill on the tourist and fishing industries of Cape Cod and the Islands predominated in all the local papers. Of the four towns studied, Edgartown, Falmouth and Nantucket were closely involved with the spill and the salvage and containment efforts. Chatham was further to the east and away from the main activity, although lobster and dragger fishermen who fished south of Nantucket were affected by a U.S. Coast Guard prohibition on vessel movements in the vicinity of the slick.

3.05 In the period between 1 January and 30 September, 1977, 194 news items appeared in editions of the Falmouth Enterprise (selected at random for analysis). These items all contained references to the sea and its use by man. Of the articles, 21 (10.8%) contained references to the Argo Merchant oil spill; 30 (15.4%) discussed other oil spills, notably that of the Bouchard 65 in Buzzards Bay, and 10 items (5.2%) referred to offshore leasing or exploration. Because an article would frequently contrast spills and oil-drilling, one with another, the actual number of articles involved was 43 (22%). Using content analysis, a pattern of news stories emerges in which the concern of the local community is reflected. This pattern follows seasonal patterns of the fishery, boating, and tourism. Thus, in July and August the predominant stories relate to beach use, sailing and boating, and harbor improvements. The commercial fishing stories deal with scallop and other shellfish seasons and licensing in the early summer and in September. Sports or recreational fishing follows the same seasonal pattern, with few mentions in the spring and maximum news interest in July.

3.06 Interest, as measured by the number of news stories about oil spills, declined after initial scientific reports on the Argo Merchant incident were published in April. The hearings of the House Committee on Merchant Marine and Fisheries' Sub-Committee on the Coast Guard held in the Cape Cod Community College in August were the subject of several articles, as was a report of further oil coming from the wreck of the Argo Merchant in September. There was, however, considerable background material relating to oil spills and oil pollution in many other articles on marine subjects. Thus, the content analysis of articles shows that only in the articles published in the July, 1977, editions of the Falmouth Enterprise sampled for the study was there an absence of material relating to oil pollution.

3.07 This analysis of background material in articles reveals that the decline in news stories is paralleled by a decline in information about oil spills in general, but that material was still present in many stories. Thus in January, oil spill stories accounted for 34% of all marine subject content, and for an additional 14% of allied items. These allied items focused on commercial fishing, legislation, and marine environmental issues. It must be pointed out, however, that in January, February, and March, many of the articles on the fishery off New England were concerned with the implementation of the 200-mile fishing zone and the management processes associated with it. This new legislation was seen as extremely important to the fishing communities in the area, and stories about it may have artificially lowered the proportion of stories dealing with oil spills.

3.08 As the year progressed, oil spill news was extensive only in April, June and August. The hearings of the Sub-Committee referred to earlier accounted for much of the material which appeared in August, while the publication of

the preliminary scientific report by NOAA in April triggered off a spate of news stories. A similar report by NOAA/NMFS on the fishing study published in June also led to a number of articles. In each case, editorial comment was made by all the regional newspapers, and calls were made for stronger preventative measures; particularly against ships, better cleanup procedures, and simpler damage claims' procedures.

3.09 The chronology of reportage thus reflected the trends of the newsworthiness of news stories as well as other seasonal activities. Reports in the Falmouth Enterprise of January 18, 1977, of the oil spill accompanied other reports about business seminars run by the Falmouth Chamber of Commerce for persons interested or working in seasonal retail or resort businesses, and the record yields of scallop beds off Orleans and Brewster. The same issue also included an article on the participation of the United States in ICNAF. The "Zerda" oil spill in Great Harbor, Woods Hole, was reported on February 18 in the Falmouth Enterprise, and news stories in the same issue dealt with the replacement of beach bath houses and planned fisheries jurisdiction enforcement by helicopters and hydrofoils. The Falmouth Enterprise also reported on March 18 that five times more scientists had visited Nantucket than oiled seabirds had come ashore after the Argo Merchant oil spill, and that this had provided a welcome fillip to the economy. In the same issue, a long article on Representative Studds' views on flag of convenience shipping and its regulation was printed. In nearly every issue of the regional papers the juxtaposition occurred.

3.10 Our survey of the press material led us to the following conclusions. First, that the population of the Cape and Islands were well served by the local press in the provision of information of oil and maritime related matters. Secondly, that the reportage reflected the best information available, and that there was adequate cross-referencing of contents of news stories for any reader to be able to obtain a balanced view of maritime affairs.

3.11 Other sources of information were available to the general public. The Audubon Society, for example, mailed a circular letter to many residents of the Cape and Islands expressing concern about the affect of spilled oil on the environment, and particularly birds. The Sierra Club and the Appalachian Mountain Club also contacted residents in a similar manner. These newsletters stressed the worst possible impacts of the oil spill on the environment and asked for donations to assist the work of the organization.

3.12 Congressman Gerry Studds sends a quarterly newsletter, Report to the People, to all postal patrons in the 12th Congressional District of Massachusetts. This District includes Cape Cod, Martha's Vineyard, and Nantucket. Congressman Studds uses his newsletter both to inform local voters of events affecting them and to gather opinions. As a sponsor of the fisheries zone legislation and member of the House Committee on the Merchant Marine and Fisheries, Representative Studds has shared his thoughts on marine affairs with constituents for some years. The debate on offshore drilling, as well as vessel-source pollution, has been a topic discussed in issues of Report to the People prior to the Argo Merchant incident; Mr. Studds had introduced previous Bills to the House of Representatives seeking better provisions for liability in the event of pollution. In consequence, the Argo Merchant oil spill and the legislative problems it posed were fully aired in the issues of Report to the People circulated in the first nine months of 1977.

3.13 These printed sources, coupled with participation in public meetings and congressional hearings held on Cape Cod, gave residents in the towns sampled a broad overview of the oil and its effects. It was these sources of information and their effectiveness in reaching the population that we sought to examine in our study.

#### Section 4: Characteristics of those interviewed

4.01 For the purposes of this study two distinct groups were singled out for interviews. One group, of 48 businesspeople, was selected for the purpose of providing information on the business climate prevailing in the first three-quarters of 1977 (see Table 4.1). The sample was selected from the lists of businesses supplied to the research team by the local Chambers of Commerce, and in each case either the owner or manager was interviewed. The objectives of this sample were, therefore, to see that the businesses were representative of

Table 4.1: Profile of sample of businesses, by community.

Business	Chatham	Edgartown	Falmouth	Nantucket	N
Hotel/Motel	3	3	2	3	11
Real Estate	1	2	2	1	6
Sports/tackle shop	2	2	2	2	8
Marina/boatyard	1	1	2	1	5
Fish wholesale/retail	2	2	2	2	8
Drug store/crafts/ variety store	2	1	2	1	6
Bicycle rentals	-	2	1	1	4
TOTALS	11	13	13	11	48

all the members of local Chambers of Commerce and were, because of the time of the year, normally open year-round.

4.02 The second sample, of 260 persons, was selected at random from listings in telephone directories which were in turn checked against voters' lists. The methodology used in this operation is explained in Appendix 1. The method of sampling was such that heads of households were to be selected. Table 4.2 shows

that our respondents have an estimated mean age of 51 years, and a modal age of 39 years.

Table 4.2: Age\* distribution of the interview sample.

Age in years	Chatham	Falmouth	Edgartown	Nantucket	N
17 - 26	2 (3%)	3 (4%)	2 (3%)	3 (5%)	10 (4%)
27 - 36	9 (14%)	16 (21%)	14 (23%)	5 (9%)	44 (17%)
37 - 46	8 (12%)	12 (16%)	5 (8%)	10 (17%)	35 (13%)
47 - 56	16 (24%)	19 (25%)	10 (16%)	21 (36%)	66 (25%)
57 - 66	13 (20%)	12 (16%)	19 (31%)	13 (22%)	57 (22%)
67+	18 (27%)	13 (17%)	10 (16%)	6 (10%)	47 (18%)
No estimate			1 (1%)		1 (> 1%)
TOTALS	66 (100%)	75 (100%)	61 (100%)	58 (100%)	260 (100%)

Modal age = 39 years; Mean age = 51 years; percentages are rounded off.

\*Respondents' ages were estimated by the interviewers.

4.03 The population of Barnstable County, 126,481 in the State census of 1975, has doubled in the past twenty years. This trend is reflected in both the age distribution of the sample and in the length of residence in the community. Cape Cod and the Islands attract many retirees from the urban areas of the Northeast, a number of whom have had summer homes in the region. The influx of these people is shown in Table 4.3. While the proportion of persons residing in the Cape Cod communities for less than twenty years approaches two-thirds of the population, the Island communities have had less of an influx of people.



Table 4.3: Length of residence in the four communities.

No. of years	Chatham	Falmouth	Edgartown	Nantucket	N
1 - 10	35 (53%)	31 (41%)	22 (36%)	18 (31%)	106 (41%)
11 - 20	8 (12%)	16 (21%)	3 (5%)	8 (14%)	35 (13%)
21 - 30	8 (12%)	14 (19%)	12 (20%)	7 (12%)	41 (16%)
31 - 40	4 (6%)	5 (7%)	5 (8%)	6 (10%)	20 (8%)
41 - 50	7 (11%)	4 (5%)	4 (6%)	8 (14%)	23 (9%)
50+	4 (6%)	5 (7%)	15 (25%)	11 (19%)	35 (13%)
TOTALS	66 (100%)	75 (100%)	61 (100%)	58 (100%)	260 (100%)

This trend reflected in the State census of 1975 is partly because of the relative inaccessibility of the Islands and partly because of the lack of year-round employment opportunities.

4.04 It must be noted that our respondents did not move to the Cape and Islands to get away from family ties; the majority had relatives living nearby. Thus, the

Table 4.4: Distribution of respondents with relatives living nearby.

Relatives	Chatham	Falmouth	Edgartown	Nantucket	N
Yes	41 (62%)*	45 (60%)	42 (69%)	33 (57%)	161 (62%)
No	25 (38%)	30 (40%)	16 (26%)	23 (40%)	94 (36%)
N.R.			3 (5%)	2 (3%)	5 (2%)
TOTALS	66 (100%)	75 (100%)	61 (100%)	58 (100%)	260 (100%)

\*Percentages are rounded off.

sense of community derived by our interviewers from other sources, e.g. involvement in community affairs, is brought out by the density of family ties to the region. This sense of permanent community structures, and the general affluence of our respondents, is also shown in the patterns of home ownership and type of dwelling. Overall, 80% of our respondents owned their own homes, and 91% lived in single family homes. It must be pointed out that many of those living in

Table 4.5: Forms of housing occupied by respondents.

House type	Chatham	Falmouth	Edgartown	Nantucket	N
Apartment	3 (5%)	11 (15%)	1 (2%)	5 (9%)	20 (8%)
Small house*	32 (48%)	28 (37%)	44 (72%)	40 (69%)	144 (55%)
Large house**	31 (47%)	36 (48%)	15 (25%)	11 (19%)	93 (36%)
Duplex			1 (2%)	2 (3%)	3 (1%)
TOTALS	66 (100%)	75 (100%)	61 (100%)	58 (100%)	260 (100%)

\*A small house was defined as 7 rooms or less.

\*\*A large house was defined as more than 7 rooms, including kitchen and bath.

Percentages are rounded off.

Table 4.6: Distribution of home ownership among respondents.

Own dwelling	Chatham	Falmouth	Edgartown	Nantucket	N
Yes	56 (85%)*	57 (76%)	54 (89%)	41 (71%)	208 (80%)
No	10 (15%)	18 (24%)	7 (11%)	17 (29%)	52 (20%)
TOTALS	66 (100%)	75 (100%)	61 (100%)	58 (100%)	260 (100%)

\*Percentages are rounded off.

apartments are small business owners who live over their place of work. Again, a local anomaly is the number of residents, particularly young people, who rent houses for the winter season. Partly this results from zoning requirements and the high cost of modest homes, but also reflects an adaptation to the surplus of housing in the area during the winter months. During the summer season these people share homes with kin or friends.

4.05 The interviewers ascertained the education level of our respondents and we found them to be well educated with 63% having more than 12 years of schooling.

Table 4.7: Education of respondents, by community.

Years of education	Chatham	Falmouth	Edgartown	Nantucket
1 - 6		1 (1%)		3 (5%) 4 (2%)
7 - 9		4 (5%)	2 (3%)	2 (3%) 8 (3%)
10 - 12	24 (37%)*	20 (27%)	22 (36%)	19 (33%) 85 (33%)
13 - 16	28 (42%)	33 (44%)	33 (54%)	23 (40%) 117 (45%)
17+	14 (21%)	17 (23%)	4 (7%)	11 (19%) 46 (18%)
TOTALS	66 (100%)	75 (100%)	61 (100%)	58 (100%) 260 (100%)

\*All percentages are rounded off.

Table 4.8 shows the highest level of educational institutions attended by our respondents. It must be noted that the township of Falmouth includes the village of Woods Hole, and some members of the marine scientific and research institutions situated there live in Falmouth Center. While this is not reflected to any marked degree in either Tables 4.7 or 4.8, it is reflected in the tables in Sections 5 and 6.

Table 4.8: Last educational institution attended by respondents by town.

Institution	Chatham	Falmouth	Edgartown	Nantucket	N
Grade school		2 (3%)		3 (5%)	5 (2%)
Junior high		4 (5%)	2 (3%)	7 (12%)	13 (5%)
High school	24 (34%)*	33 (44%)	22 (36%)	22 (38%)	101 (39%)
College	28 (42%)	23 (31%)	20 (33%)	16 (28%)	87 (33%)
Graduate school	14 (21%)	12 (16%)	2 (3%)	7 (12%)	35 (13%)
No response		1 (1%)	15 (25%)	3 (5%)	19 (7%)
TOTALS	66 (100%)	75 (100%)	61 (100%)	58 (100%)	260 (100%)

\*All percentages are rounded off.

The educational responses also reflect the settled nature of the island communities to a certain extent, and also the relatively limited number of job opportunities on the islands.

4.06 The occupations of the respondents reflect the small business, service sector economy of the region, as outlined in Section 1. The unskilled and semi-skilled occupations on the Cape and Islands are under represented in this sample. However, it must be pointed out that many of our respondents held two jobs - normally seasonally, but occasionally year-round. This is particularly true of the fishing communities of Chatham and Nantucket where one finds fishermen who are also students, taxi operators, realtors, or truck drivers, for example. The trend is reflected in the occupations of the Falmouth housewives (N = 8). Since Falmouth Center has a relatively stable, year-round economy, there is apparently less need for housewives to take seasonal employment.

Table 4.9: Occupations of respondents, by community.

Job type	Chatham		Falmouth		Edgartown		Nantucket		N	
Proprietor**	14	(21%)*	13	(17%)	11	(18%)	5	(9%)	43	(17%)
Manager/Exec.	15	(23%)	11	(16%)	15	(25%)	7	(12%)	48	(18%)
Professional	17	(26%)	23	(31%)	18	(29%)	23	(40%)	81	(31%)
Skilled	18	(27%)	2	(3%)			5	(9%)	25	(10%)
Semi-skilled	1	(1%)	2	(3%)			2	(3%)	5	(2%)
Unskilled			1	(1%)	1	(2%)	3	(5%)	5	(2%)
Retired	1	(1%)	12	(16%)	14	(23%)	9	(15%)	36	(14%)
Unemployed			1	(1%)	1	(2%)	3	(5%)	5	(2%)
Other (e.g. housewife; student)			10	(13%)	1	(2%)	1	(2%)	12	(5%)
TOTALS	66	(100%)	75	(100%)	61	(100%)	58	(100%)	260	(100%)

\*All percentages are rounded off.

\*\*Where a person has two jobs of different categories, the higher category only is shown; where a person is employed part-time or seasonally, but is otherwise retired or a student or housewife, the part-time job is shown.

4.07 There is, as one would expect from the number of respondents reporting managerial and professional-type occupations, a relatively low mobility rate between jobs or job types. This is, of course, related to the degree of mobility between communities. As we saw from Table 4.3, there has been some considerable influx of respondents into the Cape Cod communities, and a lesser migration into the Island towns. This is reflected in the information on length of time that jobs have been held by respondents. In particular, the respondents on Nantucket Island show a greater stability of employment than the other respondents. Table 4.11 shows the number of respondents with second jobs. It should be noted that the majority (82%) of these second jobs are seasonal, e.g. summer help in guest houses

Table 4.10: Length of time in the respondents' present job, by community.

Time in years	Chatham	Falmouth	Edgartown	Nantucket	N
1 - 5	24 (37%)	20 (38%)	21 (47%)	13 (29%)	78 (38%)
6 - 10	11 (17%)	10 (19%)	8 (18%)	9 (20%)	38 (18%)
11 - 20	14 (22%)	6 (12%)	7 (16%)	9 (20%)	36 (17%)
21 - 30	8 (12%)	5 (10%)	6 (13%)	5 (11%)	24 (12%)
31 - 40	4 (6%)	4 (8%)	1 (2%)	7 (16%)	16 (8%)
41 - 50	4 (6%)	2 (4%)	1 (2%)	2 (4%)	9 (4%)
51+		5 (10%)	1 (2%)		6 (3%)
TOTALS	65 (100%)	52 (100%)	45 (100%)	45 (100%)	207 (100%)

Table 4.11: Second jobs held by respondents, by community.

Second job	Chatham	Falmouth	Edgartown	Nantucket	N
Yes	14 (21%)*	20 (27%)	31 (51%)	29 (50%)	94 (36%)
No	52 (79%)	55 (73%)	30 (49%)	29 (50%)	166 (64%)
TOTALS	66 (100%)	75 (100%)	61 (100%)	58 (100%)	260 (100%)

\*Percentages are rounded off.

and restaurants. There is a marked difference between the Island and Cape Cod towns on this point. As can be seen from Table 4.11 approximately 50% of all respondents from the Island towns held second jobs. Approximately 24% of the sample drawn from the Cape Cod towns held second jobs. When the proportion of

holders of second jobs is contrasted with the number of respondents engaged in gainful employment, we find that two-thirds of those respondents from the Islands hold second jobs. The proportion for the respondents from Cape Cod is 29%.

4.08 We were also interested in discovering the relationship between our respondents and maritime activities and occupations. The interviewers discovered that 28% of all the sample have or had had maritime related occupations (see Table 4.12). A third of the sample had relatives in maritime occupations (see Table 4.13). While Edgartown has a higher proportion (39%) of respondents who

Table 4.12: Distribution of respondents who have, or had, a maritime occupation, by community.

Maritime job	Chatham	Falmouth	Edgartown	Nantucket	N
Yes	16 (24%)*	20 (27%)	24 (39%)	14 (24%)	74 (28%)
No	50 (76%)	51 (68%)	36 (59%)	34 (59%)	171 (66%)
No response		4 (5%)	1 (2%)	10 (17%)	15 (6%)
TOTALS	66 (100%)	75 (100%)	61 (100%)	58 (100%)	260 (100%)

\*Percentages are rounded off.

are or have been in maritime occupations, Nantucket does not. This could be a result of under reporting, or alternatively Edgartown has attracted a higher proportion of retirees from maritime occupations. The latter is probably the case since 51% of the Edgartown respondents reported that they had relatives who were, or had been, engaged in maritime occupations; a proportion which is significantly higher than in the other towns.

Table 4.13: Respondents' relatives who have or had maritime jobs, by community.

Relative(s) in a Maritime job(s)	Chatham	Falmouth	Edgartown	Nantucket	N
Yes	17 (26%)*	22 (29%)	31 (51%)	17 (29%)	87 (33%)
No	48 (73%)	53 (71%)	30 (49%)	38 (66%)	169 (65%)
No response	1 (1%)			3 (5%)	4 (2%)
TOTALS	66 (100%)	75 (100%)	61 (100%)	58 (100%)	260 (100%)

\*Percentages are rounded off.

4.09 To further understand the knowledge base and the perceptions from which our respondents viewed the Argo Merchant grounding, the interviewers questioned the respondents about their use of the sea as a recreational resource. Table 4.14 shows that while two-thirds of the whole sample used the ocean and the beaches for leisure activities in the summer, there was a wide variation between towns. During the winter months only 11% of those interviewed said they made use of the sea and

Table 4.14: Number (and percentage) of respondents' using the sea and seashore in leisure activities, by community.

Season of use	Chatham	Falmouth	Edgartown	Nantucket	N
Summer	37 (56%)*	54 (72%)	32 (52%)	48 (83%)	171 (66%)
Winter	3 (5%)	8 (11%)	13 (21%)	4 (7%)	28 (11%)

\*The percentages are rounded off and represent the % of the community using the resource.



seashore for recreational purposes. It should be noted here that heads of households were interviewed in this study, and that the summer season is the busy, economically important, time of the year for these towns. In consequence, the respondents may be reporting only their own use and not use made of the coastline by their families.

4.10 The sources of information for our respondents were also of interest for the survey design. As can be seen from Table 4.15, 91% of the respondents said they read a newspaper each day, and 89% of the whole sample watched television news bulletins. Radio was used as a source of information on current events by 81% of the sample, while news magazines were read by 80% of those interviewed. The foregoing would suggest that all our respondents were well versed in current affairs. It was not possible, however, for the interviewers to distinguish between those respondents who, for example, read the sports page only and those who took an interest in the whole gamut of information supplied by the media.

4.11 Within the main interview sample of 260 respondents, two special groups were singled out for attention. Since the sample was selected at random, 65 businesspeople were included, like all the other respondents, by chance. In addition, a group of 102 persons who engaged in fishing activities, 29 commercially, was also questioned in depth. The random sample of businessmen corroborated the information supplied by our selected sample discussed in 4.01 above. The random businesses characteristically employed between one and five employees (see Table 4.16). Over half of these businesses were seasonal, i.e., operated from May to October, and nearly half were dependent on the tourist trade. As indicated earlier, the tourist industry and its service sector is dominated by small businesses. The ownership of the businesses included in our random sample bears this out for the four towns in our sample. Of the 42 owner-operated concerns which employed less

Table 4.15: Respondents' sources of information about current events, by community and hours of the day spent reading, listening or viewing.

Source of information and hours using it	Chatham N=66 (100%)	Falmouth N=75 (100%)	Edgartown N=61 (100%)	Nantucket N=58 (100%)	N 260 (100%)
<u>T.V.: Hours viewing/day</u>					
None	4 (6%)*	11 (15%)	6 (10%)	5 (9%)	26 (10%)
Less than 3	60 (91%)	63 (84%)	51 (84%)	49 (84%)	223 (86%)
More than 3	2 (3%)		2 (3%)	4 (7%)	8 (3%)
No response		1 (1%)	2 (3%)		3 (1%)
<u>Radio: Hours listening/day</u>					
None	7 (11%)	18 (24%)	9 (15%)	14 (24%)	48 (18%)
Less than 3	56 (85%)	54 (72%)	42 (69%)	37 (64%)	189 (73%)
More than 3	3 (4%)	3 (4%)	8 (13%)	7 (12%)	21 (8%)
No response			2 (3%)		2 (1%)
<u>Newspaper: Hours reading/day</u>					
None	3 (5%)	5 (7%)	5 (8%)	7 (12%)	20 (8%)
Less than 3	63 (95%)	70 (93%)	51 (84%)	45 (78%)	229 (88%)
More than 3			3 (5%)	6 (10%)	9 (3%)
No response			2 (3%)		2 (1%)
<u>Magazine: Hours reading/day</u>					
None	7 (11%)	14 (19%)	15 (25%)	15 (26%)	51 (20%)
Less than 3	59 (89%)	61 (81%)	42 (69%)	38 (66%)	200 (77%)
More than 3			2 (3%)	5 (9%)	7 (3%)
No response			2 (3%)		2 (1%)

\*All percentages are rounded off.

Table 4.16: Size of concerns operated by random sample of businesspeople, by community.

No. of Employees	Chatham	Falmouth	Edgartown	Nantucket	N
0	1	11	2	3	17 (26%)*
1 - 5	8	7	7	8	30 (46%)
6 - 10	1				1 (2%)
11 - 20		3			3 (8%)
21 - 30	2				2 (3%)
31+	1	2	2	1	6 (9%)
No response	1	3		2	6 (9%)
TOTALS	14	26	11	14	65 (100%)

\*All percentages rounded off.

Table 4.17: Ownership of the businesses operated by respondents, by community.

Ownership	Chatham	Falmouth	Edgartown	Nantucket	N
Sole owner	8	20	6	11	45 (69%)*
Partnership (family)	1	1	1		3 (5%)
Partnership (non-family)		1		1	2 (3%)
Corporation	4	3	3	2	12 (18%)
Other	1	1			2 (3%)
No response			1		1 (2%)
TOTALS	14	26	11	14	65 (100%)

\*All percentages rounded off.

than five persons, the majority had been established within the past two years by migrants to the region. Many of these were people who had retired early and moved to an area which they had visited as vacationers or known as summer residents. While some businesses, such as the antique trade, are not dependent upon tourists

Table 4.18: Seasonality of businesses operated by respondents, by community.

	Chatham	Falmouth	Edgartown	Nantucket	N.
Summer only	9	10	9	7	35 (54%)*
Year-round	5	16	2	7	30 (46%)
TOTALS	14	26	11	14	65 (100%)

\*Percentages are rounded off.

since they have a New England-wide market and could be located almost anywhere, others require a larger population to support them year round. Falmouth township, with a population of 21,000, is thus able to sustain smaller, tourist-oriented, concerns year round when Chatham and Edgartown cannot. Table 4.19 shows this.

Table 4.19: Self-defined dependence on tourists of businesses operated by respondents, by community.

	Chatham	Falmouth	Edgartown	Nantucket	N.
Tourist dependent	6	10	7	7	30 (46%)*
Tourist independent	8	16	4	7	35 (54%)
TOTALS	14	26	11	14	65 (100%)

\*Percentages are rounded off.

4.12 In Section 2, the fishing activities of respondents in the random sample were referred to as an indicator of damage to the fisheries. Table 4.20 shows the distribution of this portion of the random sample. It can be easily

Table 4.20: Fishing activities by respondents, by community.

Fishery	Chatham	Falmouth	Edgartown	Nantucket	N
Commercial	10 (15%)*	2 (3%)	9 (15%)	8 (14%)	29 (11%)
Recreational	14 (21%)	19 (25%)	21 (34%)	19 (33%)	73 (28%)
TOTALS	24 (36%)	21 (28%)	30 (49%)	27 (47%)	102 (39%)

\*Percentage of all respondents in each community.

seen from Table 4.20 that in this random sample of heads of households there are distinct differences in the use of the fishery resource between mainland and Island communities. This will be discussed later as a factor in the perceptions the respondents had of the impact of the Argo Merchant oil spill upon their lives.

4.13 To summarize then, the characteristics of our randomly selected sample of 260 persons from the four towns are that they are young to middle-aged (modal age 39, mean age 51 years), are mostly immigrants into their respective communities and are well educated. A large proportion (66%) are professionals, managers, executives, or owners of businesses. In fact, the last group, owners, comprises 25% of the sample. A sizable portion (33%) of the sample self-defined their occupations as water-related. Two-thirds of the sample engaged in water-related activities (e.g. boating or fishing) during the summer, while only 11% do so in the winter months. Finally, our respondents reported that they spend a great deal of

time each day utilizing mass media. Newspapers were read by 89% of the sample for up to three hours per day, and television was watched by 87% for a similar period. Listening to the radio was an activity engaged in by 73% of the sample for up to three hours per day. Finally, 39% of the sample use the fishery resource for recreation or for a livelihood.

## Section 5: Knowledge of our informants of oil pollution and the Argo Merchant

5.01 The purpose of discovering the level of knowledge possessed by members of our samples was to assess the impact of levels of information upon the behavior of the local population. The authors hypothesized that the more accurate and complete the knowledge possessed by a respondent was, the more rational his response to oil pollution would be in his assessment of its effects and his resulting behavior. While there was some evidence to support this concept, it was not conclusive.

5.02 It must be noted that the research took place in the tenth and eleventh months after the Argo Merchant spill had occurred. In the researchers' view this should have allowed respondents to assess the impacts of the spill on their lives. However, it was discovered that the Argo Merchant accident had become a non-event and that fully 69% of the respondents were either badly informed or not informed about the incident. The wreck of the Argo Merchant had become a media event, lost in a multitude of visual images.

5.03 In order to construct a knowledge scale it was decided to use the two major spills on Cape Cod in the winter of 1976-77 as indicators. Initially the researchers believed that a well-informed person in the Cape Cod region would be able to identify the two major pollutants (the Argo Merchant and the Bouchard 65) and the location of the incidents. Thus, it was expected that a well-informed person would know of the spills off Nantucket and in Buzzards Bay and probably would be able to identify other cases of oil pollution as well. The researchers had predicted that between 25% and 33% of the respondents would fall into this category, but in fact, only 14% of the randomly sampled population did so. It was expected that between 33% and 50% of the population would be moderately informed, that is, be able to tell an interviewer the name of one of the vessels and

the location in which it went aground. Such a person would probably have incomplete information about other pollution incidents. In reality only 17% of the sample could be classified as moderately informed. A third category, badly informed, had been predicted which would include those who could only recall either the name, of either the Argo Merchant or Bouchard 65, or the location of the spill incident. It had been expected that between 25% and 33% of the sample population would fit into this category, but in reality 63% did so. A further 6% of the sample were either not informed at all or had no recall of the two oil spills.

5.04 This lack of information on the part of the sample was most surprising in view of their reported use of the media. As we have seen from Section 4, 89% of those interviewed said that they watched television for at least one hour each day, 91% read a newspaper for more than an hour each day, and 81% listened to the radio for an hour a day. Even allowing for over-reporting by the sample, and halving the mean time spent in these media activities to ninety minutes per day, the evidence of poor information retention on the part of respondents is overwhelming. Moreover, there are significant differences between the towns sampled, as shown in Table 5.1

Table 5.1: Number of respondents in knowledge groupings by town.

	Chatham		Falmouth		Edgartown		Nantucket		N.	
Well informed <sup>1</sup>	7	11% <sup>5</sup>	16	21%	9	15%	4	7%	36	14% <sup>6</sup>
Moderately informed <sup>2</sup>	12	18%	18	24%	6	10%	9	16%	45	18%
Badly informed <sup>3</sup>	43	65%	32	43%	45	74%	44	76%	164	63%
Not informed <sup>4</sup>	4	6%	9	12%	1	2%	1	2%	15	6%
N =	66	100%	75	100%	61	100%	58	100%	260	100%

<sup>1</sup>= Well-informed respondent could identify two or more marine pollution incidents (i.e. names of vessels) and their location.

<sup>2</sup>= Moderately-informed respondent could identify one marine pollution incident and its location.

<sup>3</sup>= Badly-informed respondents could identify either a marine pollution incident (i.e. name of vessel) or its location.

<sup>4</sup>= Not-informed respondents could not identify or recall either a marine pollution incident or the location of an incident.

<sup>5</sup>= Percentages are for samples for towns and are rounded.

<sup>6</sup>= Percentage of whole sample.



5.05 As a cross-check on the scale developed, interviewers asked respondents for the name of any individual or agency responsible for the cleanup of oil spills. This is a duty of the United States Coast Guard, and one which the majority of respondents would have seen or heard discussed in the media and the literature of concerned groups. Table 5.2 shows that 62% of all respondents correctly identified the Coast Guard as an agency responsible for cleanup operations. There was, however, a significant difference in this knowledge between the well and moderately-informed groups and the badly and not-informed groups. In the former grouping 77% of the respondents said the Coast Guard had cleanup responsibilities and in the latter grouping, 55% believed the Coast Guard was a responsible agency.

Table 5.2: Proportion of the respondents correctly identifying the Coast Guard as an agency responsible for oil spill cleanup, by town and knowledge grouping.

	Chatham	Falmouth	Edgartown	Nantucket	N.
Well informed	6 (86%) <sup>1</sup>	12 (75%) <sup>1</sup>	8 (89%) <sup>1</sup>	2 (50%) <sup>1</sup>	28 (78%) <sup>2</sup>
Moderately informed	9 (75%) <sup>1</sup>	12 (67%) <sup>1</sup>	6 (100%) <sup>1</sup>	7 (78%) <sup>1</sup>	34 (76%) <sup>2</sup>
Badly informed	24 (56%) <sup>1</sup>	15 (47%) <sup>1</sup>	25 (56%) <sup>1</sup>	26 (59%) <sup>1</sup>	90 (55%) <sup>2</sup>
Not informed	<u>2</u> (50%) <sup>1</sup>	<u>6</u> (67%) <sup>1</sup>	<u>0</u> (0%) <sup>1</sup>	<u>0</u> (0%) <sup>1</sup>	<u>8</u> (53%) <sup>2</sup>
N =	41 (62%) <sup>3</sup>	45 (60%) <sup>3</sup>	39 (65%) <sup>3</sup>	35 (60%) <sup>3</sup>	160 (62%) <sup>4</sup>

<sup>1</sup>Percentage of the knowledge group for each town.

<sup>2</sup>Percentage of the knowledge group in the whole sample.

<sup>3</sup>Percentage of the sample in each town correctly identifying the Coast Guard.

<sup>4</sup>Percentage of the whole sample.

5.06 There was, however, considerable confusion between the roles played by the Environmental Protection Agency, the National Oceanic and Atmospheric Administration (especially the National Marine Fisheries Service) and the Commonwealth of Massachusetts, and those of the Coast Guard. This confusion is reflected in Tables 5.3A, B, C and D. The confusion was traced in many interviews to the pronouncements of Russell Train, then Administrator of EPA, at the time of the spill that EPA was taking over the lead role in assessment of impact. A further source of confusion was the knowledge of fishermen and Falmouth residents of the research activities of NOAA, in particular NMFS, as well as the activities of the Coast Guard. And, finally, the media pronouncements of state officials and the activity of local government officials in shellfish monitoring, particularly in the Bouchard 65 spill, led to further confusion. A feature of the comments of the badly informed-uninformed group was the reference to private cleanup contractors, such as Jet Line Services or Cannon, as being either solely responsible for cleanup operations or working with the Coast Guard.

The use of this knowledge scale provides the reader with a basis for assessing the perceptions of respondents to the interview survey. The conclusion reached on the basis of interview questions asking respondents to identify the names of vessels and locations involved in oil pollution was that 69% of the randomly chosen sample of people living in the Cape Cod and Islands region were either badly informed or uninformed. A secondary check on this finding, knowledge of which agency was responsible for oil spill cleanup, corroborated the scale used.

Table 5.3A: Knowledge of the agency responsible for cleaning up oil spills in the marine environment of residents of Chatham.

Agency	Well Informed		Moderately Informed		Badly Informed		Not Informed		N.	
Coast Guard*	4	57%**	8	67%	22	51%	2	50%	36	55%
Coast Guard and Other	2	29%	1	8%	2	5%	0	0%	5	8%
Other	0	0%	3	25%	12	28%	1	25%	16	24%
Don't Know	1	14%	0	0%	6	14%	1	25%	8	12%
No Response	<u>0</u>	0%	<u>0</u>	0%	<u>1</u>	2%	<u>0</u>	0%	<u>1</u>	2%
N =	7	100%	12	100%	43	100%	4	100%	66	100%

\*The Coast Guard is the agency responsible.

\*\*Percentages are rounded.

Table 5.3B: Knowledge of the agency responsible for cleaning up oil spills in the marine environment of the residents of Falmouth.

Agency	Well Informed		Moderately Informed		Badly Informed		Not Informed		N.	
Coast Guard*	7	44%**	7	39%	10	31%	4	44%	28	37%
Coast Guard and Other	5	31%	5	28%	5	16%	1	11%	16	21%
Other	0	0%	1	6%	7	22%	2	22%	10	13%
Don't Know	4	25%	5	28%	10	31%	2	22%	21	28%
No Response	<u>0</u>	0%	<u>0</u>	0%	<u>0</u>	0%	<u>0</u>	0%	<u>0</u>	0%
N =	16	100%	18	100%	32	100%	9	100%	75	100%

\*The Coast Guard is the responsible agency.

\*\*Percentages are rounded.

Table 5.3C: Knowledge of the agency responsible for cleaning up oil spills in the marine environment of the residents of Edgartown.

Agency	Well Informed		Moderately Informed		Badly Informed		Not Informed		N.	
Coast Guard*	7	78%**	5	83%	23	51%	0	0%	35	57%
Coast Guard and Other	1	11%	1	17%	2	4%	0	0%	4	7%
Other	1	11%	0	0%	9	20%	0	0%	10	16%
Don't Know	0	0%	0	0%	11	24%	1	100%	12	20%
No Response	<u>0</u>	0%	<u>0</u>	0%	<u>0</u>	0%	<u>0</u>	0%	<u>0</u>	0%
N =	9	100%	6	100%	45	100%	1	100%	61	100%

\*The Coast Guard is the responsible agency.

\*\*Percentages are rounded.

Table 5.3D: Knowledge of the agency responsible for cleaning up oil spills in the marine environment of the residents of Nantucket.

Agency	Informed		Informed		Informed		Not Informed		N.	
Coast Guard*	2	50%**	6	67%	21	48%	0	0%	29	50%
Coast Guard and Other	0	0%	1	11%	5	11%	0	0%	6	10%
Other	1	25%	2	22%	10	23%	0	0%	13	22%
Don't Know	1	25%	0	0%	6	14%	1	100%	8	14%
No Response	<u>0</u>	0%	<u>0</u>	0%	<u>2</u>	5%	<u>0</u>	0%	<u>2</u>	3%
N =	4	100%	9	100%	44	100%	1	100%	58	100%

\*The Coast Guard is the responsible agency.

\*\*Percentages are rounded.

Section 6: The perceived effects of the Argo Merchant oil spill

6.01 Sections 1 and 2 described the economy and fishery of the Cape Cod and Islands region, and it was shown that there were no apparent effects of the Argo Merchant oil spill on either the fishing industry or the tourist industry. In this section, the respondents' perception of the aftermath of the spill will be discussed.

6.02 It must be noted that 71% of the sample believed that the spill had impacted the life of the region, and that this feeling was shared by all the knowledge groupings described in Section 5. This is shown in Table 6.1.

Table 6.1: Perception of effects of the Argo Merchant oil spill as described by informants.

	Chatham	Falmouth	Edgartown	Nantucket	N.
Well informed	3 5%*(43%)**	14 19% (88%)	8 13% (89%)	3 5%(75%)	28 11%(78%)
Moderately informed	6 9% (50%)	14 19% (78%)	4 7% (67%)	4 7%(44%)	28 11%(62%)
Badly informed	21 32%(49%)	28 37% (88%)	34 56% (76%)	32 55%(73%)	115 44%(70%)
Not informed	<u>3</u> 5%(75%)	<u>9</u> 12%(100%)	<u>1</u> 2%(100%)	<u>0</u> 0% (0%)	<u>13</u> 5%(87%)
N =	33 50%	65 87%	47 77%	39 67%	184 71%

\*% of whole sample for each town. Percentages are rounded.

\*\*% of knowledge grouping for each town.

These impacts included damage to fishing, damage to birdlife and oil on beaches. Some respondents reported that fishing boats and gear had been fouled by oil, and that the lobster and shellfish stocks had been impacted. Others told the interviewers that it would be impossible to swim because of oil, and that the Argo Merchant's oil had damaged the seabed and the ecology of the area. Some respondents

spoke of a possible association between the oil spill and the "red tide," and of contamination of finfish and shellfish by oil. Yet others said that there had been a loss in tourist trade, that the spill had been bad for the community because of its fearful aspects, and that the loss of the oil had been an economic loss to the community. In all fifty-three effects were described by the respondents, many of whom spoke of more than one negative impact. On the positive side, several respondents spoke of the spill as having been an economic boost to the area, and as pointing out weaknesses in the regulations and technology for dealing with oil spills.

6.03 Information about these perceived effects was drawn in the main from the media; television, radio and newspapers. Other sources were friends and relatives, marine and citizens-band radio, the Coast Guard and Woods Hole Oceanographic Institution, statements by Representative Studds and Shellfish Warden Souza, at stores and seafood markets, and actually seeing impacts of the spill. These sources are shown in Table 6.2.

Table 6.2: Knowledge of Argo Merchant spill effects by source of information and community (%). (More than one response is possible.)

Source	Community			
	Chatham	Falmouth	Edgartown	Nantucket
Television	56	61	31	39
Radio	49	37	28	16
Newspapers	49	74	68	12
Friends	7	23	37	38
Other	14	29	5	17

6.04 Many of the respondents who described effects they perceived had not, in fact, seen any of these impacts. Of the entire sample, 41% of the respondents stated that they had "seen" impacts. This is shown in Table 6.3. It should be

Table 6.3: Proportion of informants who said they had seen effects of the Argo Merchant oil spill.

	Chatham	Falmouth	Edgartown	Nantucket	N.
Well informed	2 3%*(29%)**	12 16%(75%)	7 11%(78%)	2 3%(50%)	23 9%(64%)
Moderately informed	2 3%(17%)	7 9%(39%)	4 7%(67%)	4 7%(44%)	17 7%(38%)
Badly informed	9 14%(21%)	18 24%(56%)	20 33%(44%)	15 26% (34%)	62 24%(38%)
Not informed	<u>1</u> 2%(25%)	<u>2</u> 3%(22%)	<u>0</u> 0 (0)	<u>1</u> 2%(100%)	<u>4</u> 2%(27%)
N =	14 21%	39 52%	31 51%	22 38%	106 41%

\*% of whole sample for each town. Percentages are rounded.

\*\*% of knowledge group for each town.

noted here that some respondents had not really seen any effects of the Argo Merchant, but recalled effects they had seen elsewhere and insisted that these would obtain in the Cape Cod and Islands region. Again, many of the "sightings" of impacts were in the media, and thus the effects were, for nearly 30% of the whole sample, "seen" in newspapers or on television. In particular, these respondents mentioned oiled birds and oil slicks as forms of impact. Places in which effects of oil spills had been seen by the respondents included Cape Cod, Falmouth,\* West Falmouth,\* North Falmouth,\* Buzzards Bay,\* Woods Hole Harbor,\* Wings Neck,\* Nobska Lighthouse, Woodneck Beach, South Beach, North Beach, Cape Page, New Jersey shore,

\*Oil came ashore here from the Bouchard 65 oil spill.

San Francisco Bay, Santa Barbara, Bermuda, Virginia Beach and Nova Scotia. The damage caused by the oil spills seen by respondents included oil on docks and boats, damage to marshes, fish, birds, plankton and benthic organisms, and to recreational facilities. While there is no evidence that the Argo Merchant spill caused these categories of impacts, many of the respondents apparently assumed that all oil spills would be quite similar, and that the effects of one could be the same as another.

6.05 In an effort to separate second-hand reports of impacts from the Argo Merchant oil spill from first-hand experiences and perceptions, the interviewers asked members of the sample if the spill had affected their own lives. As can be seen from Table 6.4, 34% of the respondents thought the spill had touched on their

Table 6.4: Respondents who believed the Argo Merchant oil spill had affected their life.

	Chatham		Falmouth		Edgartown		Nantucket		N.	
Well informed	1	2%*	10	13%	6	10%	2	3%	19	7%
Moderately informed	0	0	8	11%	3	5%	1	2%	12	5%
Badly informed	10	15%	15	20%	16	26%	11	19%	52	20%
Not informed	<u>1</u>	2%	<u>4</u>	5%	<u>1</u>	2%	<u>0</u>	0	<u>6</u>	2%
N =	12	18%	37	49%	26	43%	14	24%	89	34%

\*% of whole sample for each town. % are rounded.

lives. These impacts were seen as damage to the fishery, in particular shell and recreational fishing and higher fish prices. There was also marked concern with oil contamination of fish purchased from fishermen and fish dealers. As one



Edgartown woman put it:

"We stopped buying fish for a while. Everyone told me it was all right, but I thought I had better be safe than sorry. I served fish to my family for the first time this year on Memorial Day, but that was because my brother and his family had come to visit."

Several respondents saw the spill as a waste of oil and the cause of higher oil prices. Another woman from Edgartown thought that all the oil spills during the winter of 1976-77 were sabotage on the part of the oil companies: "Just dumping it into the sea so they can raise our prices." Other respondents said they had been affected because the oil had come onto the beaches and this had spoiled their enjoyment of walking by the sea or swimming. Some respondents said they were emotionally affected by the spill, and felt threatened by it, or had feelings of depression, apprehension or anger. A male respondent from Nantucket put it this way:

"Oil must have an effect on plankton life even if cleaned up. Everything survives in or from the water. Who are they kidding with asking if it affects us? Just because we don't see the oil doesn't mean it evaporated. I am as threatened as the next man."

6.06 The interviewers further sought to pinpoint impacts and asked if they knew of someone whose activities had been affected by the spill. Thirty percent of the respondents said they knew of someone who had been affected by the spill, and this is shown in Table 6.5. However, the answers to this question were not

Table 6.5: Respondents who knew of someone who had been affected by the Argo Merchant oil spill.

	Chatham		Falmouth		Edgartown		Nantucket		N.	
Well informed	1	2%*	13	17%	4	7%	1	2%	19	7%
Moderately informed	0	0%	9	12%	3	5%	3	5%	15	6%
Badly informed	8	12%	11	15%	15	25%	7	12%	41	16%
Not informed	<u>1</u>	2%	<u>2</u>	3%	<u>0</u>	0%	<u>0</u>	0%	<u>3</u>	1%
N =	10	15%	35	47%	22	36%	11	19%	78	30%

\*% of whole sample for each town. Percentages are rounded.

very specific. A number of respondents said it was too early to forecast the effects, but everyone - the whole community - had been affected by the oil spill. Others said that the ferry operation to the Islands had been curtailed during the winter and that this was because of the oil spill from the wreck of the Argo Merchant. (Note: as far as the authors are aware, the curtailment of the ferry operation in January and February, 1977, was due to ice and bad weather, and not to the oil spill.) Others said friends and relatives who were fishermen had not been able to go fishing. Some respondents said that businesses related to the tourist industry had been impacted negatively, but others said that the spill had given a much needed boost to the economy both through the publicity generated for the area and the additional people who came to the area at the time of the spill and in the ensuing weeks to undertake work on the spill. Finally, some said conservationists had been affected; one Chatham man told his interviewer:

"These Boston people want everything neat and clean and primitive here. The country needs oil and some accidents will always happen, and so beaches get oiled. They (the Boston people) jump up and down and shout ecology, but they dump more garbage in Great South Bay than ever oil goes into the sea off here. They're affected, but so what? They haven't cleaned up the slums of Roxberry and South Boston yet."

6.06 Respondents who had actually had their own activities affected or curtailed were very small in number (13) and represented 5% of the entire random sample (see Table 6.6). These responses included inability to fish in the area

Table 6.6: Respondents who reported that actual activities engaged in by them had been affected by the Argo Merchant oil spill.

	Chatham		Falmouth		Edgartown		Nantucket		N.	
Yes	2	3%*	5	7%	3	5%	3	5%	13	5%
No	<u>64</u>	97%	<u>70</u>	93%	<u>58</u>	95%	<u>55</u>	95%	<u>247</u>	95%
N =	66	100%	75	100%	61	100%	58	100%	260	100%

\*%is for the whole sample for each town. Percentages are rounded.

of the Argo Merchant oil spill and reduction of normal supply of fish and lobsters to a fish dealer. One respondent in Edgartown reported that he, and some of his friends, planned to move to a place "where there will be clean beaches for our grandchildren to enjoy in the future." Another man, from Chatham, said his income had been reduced because he had lowered the rent on his summer cottage. A store owner in Nantucket said that he had been affected because he "didn't know what stock to order for the summer season." An Edgartown woman said that she had been affected because there had been an increase in the price of fuel oil. Another Edgartown woman, who was selling her house, said that she thought the price of property had declined. A retired man on Nantucket said that all his activities had been affected; he no longer liked to walk the beaches and the knowledge that the sea was dirty appalled him. One Edgartown fisherman said his nets had been fouled by Argo Merchant oil while dragging (trawling) in Vineyard Sound, and his fishing had declined because of this. A Nantucket woman said that the beaches had been closed and that she had been unable to exercise her dogs properly. A Falmouth woman said that all her activities at the time of the spill had been affected because she was engaged in research at Woods Hole Oceanographic Institution. And finally, a Chatham woman reported that inflation caused by oil spills had reduced her retirement income.

6.07 As can be seen, the respondents perceptions of the impacts of the Argo Merchant oil spill were many and varied. Yet they are no less important in the assessment of oil spill impacts because they are imprecise and diffuse. None of the respondents placed a price upon their perceived losses, and as such they are difficult to quantify.

Section 7: Other concerns of the respondents related to oil pollution

7.01 During the course of the interviews many respondents articulated concerns which only touched on the questions of knowledge and perception with which the project was primarily concerned. This Section of the report will outline these concerns.

7.02 With regard to the cleanup of oil spills, the respondents were concerned that this should be carried out quickly, and preferably by the shipping company whose vessel had caused the spill (see Table 7.1 below). The preference for

Table 7.1: Agencies, organizations or others whom the respondents felt should be responsible for cleaning up oil spills.\*

	Chatham		Falmouth		Edgartown		Nantucket		N	
Shipping company	32	48%**	58	77%	43	70%	42	72%	175	67%
Importer	5	8%	22	29%	21	34%	5	9%	53	20%
State government	7	11%	4	5%	1	2%	0	0%	12	5%
Federal government (unspecified)	21	32%	16	21%	14	23%	3	5%	54	21%
Coast Guard	14	21%	16	21%	1	2%	15	26%	46	18%
Other government agencies	0	0%	6	8%	4	7%	5	9%	15	6%
Other	10	15%	17	23%	8	13%	9	16%	44	17%
Don't know	<u>3</u>	<u>5%</u>	<u>0</u>	<u>0%</u>	<u>0</u>	<u>0%</u>	<u>2</u>	<u>3%</u>	<u>5</u>	<u>2%</u>
No response	92 $\bar{x}$ = 1.39		139 $\bar{x}$ = 1.85		92 $\bar{x}$ = 1.51		81 $\bar{x}$ = 1.40		404 $\bar{x}$ = 1.55	

\*More than one response was possible.

\*\*Percentages are for whole sample of each town. Percentages are rounded.

shipping company sponsored cleanups by 67% of the respondents was framed in the general context of "They spilled the oil, they should clean it up." Other bodies which respondents would like to be required to cleanup spills were the United Nations, Coast Guard, EPA, NOAA/NMFS, U.S. Army Corps of Engineers, U.S. Navy, the Federal Government (agency unspecified), the National Guard and the state government. The flag state and ship's crew were mentioned by some as being the bodies who should undertake the cleanup. Other respondents suggested that the Federal Government should fund the cleanup which would then be carried out by either the state or local authorities. A few respondents suggested that any one of the cargo insurers, cargo owners or shipping company should pay the state or local authorities or private contractors to carry out the cleanup. A very few respondents said any cleanup should be left to conservation groups, such as the Audubon Society. A few respondents said that oil was a natural material and should be left to nature to cleanup. Others felt that more research on the effects of oil spills and cleanup operations was needed, and that the technologies for cleaning oil from the sea should be improved.

7.03 Many respondents (slightly over a third of the sample) raised the issue of offshore oil and gas operations on Georges Bank. The majority of this group felt that either exploration or exploitation of the resource should be delayed until better spill prevention technologies were available or the drilling should be forbidden. Thus, one man in Edgartown said:

"We could have fish for many years to come. Why ruin it with six years of oil supply from Georges Bank?"

A woman in Falmouth argued in similar terms:

"They talk about an energy crisis, but that's a load of baloney. The reason there are energy shortages is because we are using it unwisely. Why not site our houses to take advantage of the sun? Why does everyone use a car, and most families two? It's because we have our priorities

wrong. The first priority should be the food supply, such as the Georges Bank fish, and then all the other things. Drilling must be stopped before a few people seeking a profit ruin the food supply for us all."

7.04 It must be noted here that there is an apparently significant difference in attitudes concerning offshore drilling between year-round residents of the Islands of long standing, and the ideas of recent incomers and summer residents in this issue. Both persons quoted in 7.03 above are new residents of Cape Cod and the Islands. A summer resident, of some fifty years, of Nantucket placed the argument as follows:

"I am completely against oil exploration so near Nantucket both from the point of view of oil spills, transportation accidents, environmental hazards and because of the thought of hundreds of added (sic) people coming to the Island. . . If I have any say in the matter, I am thoroughly against\* oil refineries so close to a precious Island, so needed for birds, people, and natural wild life. All the tidal shores need to be protected for fish and birds - and certainly for human beings." (\*Emphasis in original letter to Dr. Fricke of 25 October, 1977 concerning an interview appointment with the respondent.)

On the other hand, a retired man, born on Nantucket who has lived there all of his life, summed up the arguments of those who saw some benefit in offshore exploration

"I feel very strongly that New Englanders, and particularly environmentalists, are 'hiding their heads in the sand' when they reject the concept of having offshore drilling, refineries and/or tanker or sea pipeline transportation of oil from offshore wells. They cannot expect other part of the country to produce the oil and refine it, while assuming the calculated risks of doing (the) same, and to have New England inviolate of such risks. . .these operations can be, and must be, conducted with minimum risk to nature and property if proper safeguards are established." (Letter to Dr. Fricke regarding interview schedule.)

An elderly woman from Chatham, who did not wish to be interviewed, wrote in part:

"My feelings in the matter are quite concise and simple. I think it's foolish to be so worried about the future coast condition as the transp. (sic) is just one of man's doings and progress must keep on, and the final, if ever, effect and loss or gain is in God's Hand and He is after all the wisest."

7.05 Concern over other forms of pollution was voiced by several respondents. Edgartown residents and businesspeople were eager to discuss problems of sewage

disposal with interviewers, and attributed decline in the quality of visitor facilities to lack of sewage services in Vineyard Haven, which in turn affected Edgartown. A more direct impact, however, was the belief that the scallop beds and beaches were being polluted by sewage effluent. Similar feelings about pollution from sewage and effluents was expressed by some Falmouth residents, one of whom remarked to an interviewer:

"What New York City dumps 15 miles offshore daily is grosser than any oil spill. We haven't reached that stage here yet, but sewage into Buzzards Bay and Great South Bay is getting to be a problem - plastic on the beaches and shit in the water don't make it wise to swim."

7.06 A problem related to town sewage - the disposal of wastes by pleasure craft and ferries - was mentioned by six respondents in the course of interviews. Again, scallop beds were the areas said to be most affected, although one respondent said that he noticed a marked difference in water quality in Vineyard Haven in the winter and summer. A Madaket (Nantucket) resident mentioned that the surface of Madaket Harbor was always covered by an oil sheen in the summer months, and that this persisted until late fall. She attributed this to the number of power boats using the Harbor during the season, and felt that there had been a decline in bird life in the area.

7.07 A Chatham businessman was concerned about the use of the town landing by non-residents:

"They come down from Boston with their boats, beer and (picnic) hampers, use the landing and fish all day and then go home. They don't contribute to the community in three ways: they compete for our fish and water space, they have their garbage all over the landing - if we are lucky in the bins - and they don't pay for anything in the town. (Interviewer: "What do you mean by 'not paying'") They don't buy anything here, they don't pay taxes here and they just use us. These day tourists are just parasites who pollute and then shout about their rights when you ask them to help with the costs. From an environmental point of view, I think building Route 3 and 6 was the worst we could have done. Chatham and Orleans have become part of the slums of South Boston."

This dichotomy of feelings about the use of the marine resource was an important thread in many of the interviews. Basically, it boiled down to who should be

allowed access to the ocean in an area of population growth which also served as a playground for the industrial cities of the North East and Canada? Nantucket has opted for controlled growth<sup>1</sup>, but the strategy for planning for Martha's Vineyard and Cape Cod has yet to be fully developed. While pollution of the waters around the region is not new, the scale on which it is now occurring is leading to considerable misgivings, and frequently these are directed at the tourists. While summer residents have visited the area for more than a century, day touring is a post-World War II phenomena, and as the roads have improved, so the impact has spread. The pollution has changed from that caused by overflowing cesspools to a proliferation of garbage on beaches and roadsides, of oily sheens around marinas, and a loss of visual amenity. Those residents who expressed concern about these forms of impact on the environment also held strong views on the transportation of oil by sea and, in particular, the wreck of the Argo Merchant. For many, the oil spill crystallized their anger about environmental pollution and provided a focus for concern.



## Footnotes

1. A. W. Simon: No Island is an Island. Garden City, N.Y.: Doubleday and Co.; 1973.

## Section 8: Conclusions

8.01 Interviews were conducted with 310 residents of Cape Cod and the Islands of Martha's Vineyard and Nantucket. Of the 262 respondents who were selected at random as a representative sample of the region, it was discovered that approximately eleven months after the event, 69% of this representative sample were either poorly informed or uninformed (or had no recall) of the Argo Merchant oil spill in December, 1976.

8.02 The study reported here had, as a basic premise, assumed that if basic information about the spill was unknown, more detailed knowledge of the extent and nature of any damage - environmental or socio-economic - would also be unknown. It can fairly be said that an uninformed public is one which is susceptible in that impressions, incomplete reports and informal sources of information can appreciably affect public opinion to the extent that a large gap exists between perception and reality.

8.03 The three major sources of information utilized by the respondents to our questions were television, newspapers and radio. If our index of knowledge, based upon recall of information about oil spills and oil spill clean up, is acceptable, these media functioned to inform and keep informed less than one-third of the sample. However, three-quarters of our respondents said they "knew" of effects of the Argo Merchant oil spill and 45% reported that they had "seen" effects, most of which were environmental. In-depth questioning of respondents by interviewers revealed that these "observed" effects were taken seriously by the respondents.

8.04 In the first part of this report, that is Sections 1 and 2, we have attempted to measure any socio-economic impacts that may have occurred. Our findings show that no effects were evident from our in-depth interviews with 48 businesspeople and from the scant statistical data available. Where concrete evidence

of impact is shown, e.g., the inability of fishermen to haul lobster pots or increased trade due to the spill, it would appear that the spill probably benefited more people than affected them adversely. In particular, fishermen took pains to point out to our interviewers that their catch had not been affected overall, and that a declining finfish catch was a long-term trend not related to any one spill and probably not to oil pollution.

8.05 Yet, three-quarters of the representative sample believed that there had been effects. The perceptions of the situation for these respondents, whether or not those perceptions square with reality, are that the Argo Merchant oil spill was damaging to the environment and/or the socio-economic life of the Cape Cod region. It is believed by the authors that knowledge of these perceptions needs to be incorporated into any efforts to inform the public and into any planning for the prevention of, or response to, oil spills.

## Appendix - Research methods

A.01 The research methods chosen for this project were eclectic since no previous work had been carried out on public perception of the socioeconomic impacts of oil spills. Three task areas were developed and researched to the extent that available information and resources permitted. The first task was the assessment of the economy and the social characteristics of the Cape Cod Region during the five years prior to the Argo Merchant oil spill. The second task was an assessment of the impact of the spill on the two major industries, tourism and fishing, of the region between January and September, 1977. Finally, an assessment of public knowledge and perception of the impact of the oil spill was made.

A.02 The first task was accomplished by undertaking searches of reports produced by local, state and national governments and local organizations, e.g. the Chamber of Commerce, on various aspects of the local economy of Cape Cod and the Islands. Since much of the information available to the public is aggregated, it was at times difficult to precisely pinpoint the regional and local activities. For example, the National Marine Fisheries Service's statistics are collected on a port of landing basis, but are not available as such except for the larger ports. The rationale behind this is that since small ports have few fishermen and merchants, port of landing information would reveal the extent and viability of individual concerns contrary to the intention of the Privacy Act.

A.03 The second task was tackled by interviewing a stratified sample of businesspeople in each of the four communities selected (see A.04) about their business operations in 1977 and by asking them to compare their experiences with preceeding years. These businesspeople, all connected with the fishing and tourist industries, were selected from lists supplied by the local Chamber of Commerce.

In all, forty-eight businesspeople were interviewed, and the average interview lasted for 80 minutes. In each case the interviewer was one or other of the authors, and the interview was an open-ended discussion of the respondent's business and its place in the local economy.

A.04 The third task, that of ascertaining the extent of knowledge and the perceptions of the general public about the socioeconomic impacts of the Argo Merchant oil spill, was accomplished by developing a random sample of the population of four communities. These communities, Nantucket and Chatham, and Falmouth and Edgartown, were paired on the basis of industry prominence. The first pair view themselves as fishing towns and the fishing industry is a major employer in each. The second pair are primarily resort towns, although some fishing is carried on. Each town has a year-round population of between 2,000 and 3,000 and each has a separate and distinct identity in the region. (For further information on each town, please see Section I.) It was determined that a random sample of heads of households would be the most appropriate method of sample. For statistical validity it was also determined that the minimum number of completed interviews in each town should be 50 and the maximum, 75. This range would yield a sample of between 2% and 2.5% of the entire population, and between 7.5% and 9% of total households of year-round residents and property-owning seasonal residents.

A.05 The sample was selected by Mrs. Stack and Miss Carmical initially by entering telephone directories for the area with random numbers taken from a five figure random number table. By using the random number to indicate, in order, the page number and entry number on the page, the name and address of the resident first listed following the entry number was selected. This process was used to select the names and addresses of 150 persons for each town, with replacements

selected for duplicates. The list generated was then checked against back copies of telephone directories and local property and tax rolls in order to eliminate persons who had visited the region for one summer only, but whose telephone had been listed in the current telephone directory. It was discovered that approximately one-third of the sample, or 189 entries, were of this nature, and a further two hundred names were selected at random and similarly cross-checked.

A.06 Letters were sent to 573 residents of the four towns in September, 1977, informing them of the study and asking for their cooperation. In October, telephone contacts were made with 278 persons and interview schedules were developed. Of the 295 persons who were not contacted by telephone, the letters to 131 were returned marked "addressee unknown" or "deceased," and 31 persons wrote saying that they would be unable to participate or were not interested in participating in the study. It was not possible to contact by telephone the remaining 133 persons, although attempts to do so were made by Dr. Fricke and Miss Pace on at least four occasions. Of the 278 persons with whom contact was made, 18, or 6.4%, declined to be interviewed.

A.07 The names of persons who had agreed to be interviewed for the study were then handed to the interviewers who arranged times and places of meeting with the respondent at the respondent's convenience. Interviews were usually held in the respondent's home, were open-ended in nature and lasted for forty minutes on an average. The longest interview (in Edgartown) lasted for 2½ hours and the shortest (in Chatham) for thirteen minutes. The interviewers, Tanya Anderson, Justine Lewis, Margaret Pace, Joyce Stratton and Nathalie Ward, assured respondents of the confidentiality of their responses and described the purpose of the project - in general terms - to the respondent. Checks on interviewer

performance were made by Dr. Fricke, and the utility of the two-day interviewer training session held in October, 1977, was demonstrated by the response rate and cooperativeness of respondents. Interviewing was extended over the Thanksgiving Holiday to accommodate seasonal residents selected in the sample who returned to the area for that weekend.

A.08 Analysis of the interviews was carried out at East Carolina University using content analysis techniques developed by the authors. Preliminary analysis, as shown in this report, was completed in January, 1978. An additional secondary analysis will be performed on the data when it has been prepared for computer use.

A.09 The techniques used in this study, while in many ways very general, proved to be of utility in addressing the problem of post-oil spill research. However, the economic and employment information was, at best, poor and frequently not good. Access to non-aggregated data would have resolved many of these problems.