

Mapping Mobility: The Movement of New England Multispecies Vessels and Crew

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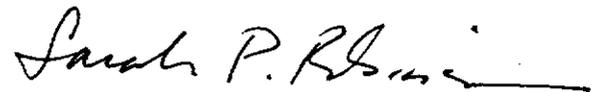
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Lead PIs:

Jennifer F. Brewer
National Research Council
Washington, D.C.
(207) 350-6955
jbrewer@clarku.edu

Sarah P. Robinson
Harvard University
Cambridge, Massachusetts
(617) 547-4151
sprobins@fas.harvard.edu



Abstract:

This project examined patterns of mobility and immobility in two sets of New England fishing businesses involved in the multispecies groundfishery: those with vessels for which Gloucester, Massachusetts was principal port in 2003, and those with vessels for which Portland, Maine, was principal port in 2003. In addition to patterns of mobility and immobility, the project examined social structures and practices that may influence related business decisions. Scientific and fishing industry collaborators collected and analyzed quantitative and qualitative data pertaining to these questions through interviews conducted with random samples of industry members in the two ports. Years of research interest were primarily encompassed by the two decade period between 1983 and 2004.

Introduction:

The structures and practices of New England groundfishing firms, including mobility patterns, are directly relevant to active areas of discussion in marine and fisheries policy. Different structures, practices, and mobility patterns present different challenges and opportunities in the development of fisheries policy and regulation. Different regulatory and policy decisions affect firms and groups differently, and will be responded to differently, depending on their business and livelihood strategies. The period of research interest is one in which the groundfishing industry experienced dramatic ecological, economic and regulatory changes. Neither public nor scientific discussions have thoroughly examined the ways in which spatial and other social-economic dimensions of the industry are closely related to ongoing debates concerning overfishing definitions and indicators, seasonal and year-round area closures, sector catch allocations, area management proposals, marine protected areas, cuts in days-at-sea, definitions of community in impact assessments, and other issues.

Objectives:

This project intended to 1) document patterns of mobility, immobility, and associated social-economic practices in the operations of fishing businesses, 2) document relationships among the boats and people affiliated with these businesses as they pertain to spatially-specific business operations, 3) execute this research as a collaborative project of scientists and fishing industry members.

Participants:

Jennifer Brewer (original PI)*
National Research Council
Washington DC
(207) 350-6955
jbrewer@clarku.edu

Sarah Robinson (original PI)*
Harvard University
Cambridge, MA
(617) 547-4151
sprobins@fas.harvard.edu

David Bergeron*
Massachusetts Fishermen's Partnership
Gloucester, MA
(978) 282-4847
dbergeron@mass-fish.org

Gina LeDuc Kuntz (original PI)*
F/V Resurrected
Freeport, ME
(207) 865-9108
ginaleduc@aol.com

Christine Sherman (original PI)*
F/V Lady Jane
Gloucester, MA
(978)-281-4651
captain@gis.net

James Wilson (original PI)
University of Maine
Orono, ME
(207) 581-4368
jwilson@maine.edu

Don King*
F/V Scotia Girl & Homeward Bound Co., Inc.
Gloucester, MA
dpking@verizon.net
(978) 973-7925

Cheryl Briscoe
Homeward Bound Co, Inc.
Gloucester, MA
cheryl.briscoe2@verizon.net

Nina Groppo
Massachusetts Fishermen's Partnership
Gloucester, MA
(978) 282-4847
ninagroppo@yahoo.com

* played key roles in project design and/or implementation.

Methods:

Detailed descriptions of methods used are provided in the attached documents. In summary: A common field methodology was developed for study sites in Gloucester, Massachusetts and Portland, Maine. These sites were chosen for several reasons, including a paucity of comparative research involving the two ports, and similarities and differences between the two sites identified by the research team. Randomized samples of 2003 multispecies permit holders were developed from publicly available NOAA databases. A total of 58 interviews were conducted by industry and scientific project participants, guided by prepared survey questions to collect quantitative and qualitative information. Data summaries and analysis follow in the attached documents. (Development of a geographic information system was initiated but not completed due to a convergence of constraints in available participant time and funding. The number of interviews conducted was curtailed for similar reasons.)

Data:

A number of datasets were produced, some including raw data and others including data processed for various quantitative and qualitative analyses. Further analyses of the data are planned, both in the short and longer term. Some datasets cannot be shared publicly due to the difficulty of protecting interviewee anonymity. Some data can be shared following additional analyses, and the elimination of information that could be used to identify individual interviewees.

Results and Conclusions:

Detailed results and conclusions are provided in the attached documents. General conclusions include the following:

During the two decades of research interest, permit holders with Portland home-ported groundfishing businesses, have maintained core business operations locally, with limited use of ports outside the state of Maine. It is possible that some changes are occurring in this pattern. Crew followed somewhat more varied patterns with respect to place-based decision making.

In Gloucester, the analytic unit was fishing business, defined as an individual or group of individuals owning and controlling a vessel or a set of vessels. The structures of these businesses in 2003 and their fishing and mobility strategies in 2003 are explored and described. Findings indicate that about one-half the businesses in Gloucester in 2003 did not use mobility as a strategy in 2003 but that the other one-half of the businesses did use mobility – in some form – as a strategy in 2003. Those using mobility as a strategy, however, appeared to be doing so as a means of maintaining a kind of fixity, that is, as a means of remaining in place as groundfishing businesses in Gloucester.

Partnerships:

The project took a very collaborative approach to research design, data collection, and preliminary data analysis. Discussion and collective input were accomplished through extended meetings and phone meetings over a long period of time. Extensive training was provided to fishing industry members. In the latter stages of the project, as deadlines loomed and data

analysis necessarily became more specialized and technical, fully collaborative project roles became more difficult to maintain. Pending tasks were reassigned to the extent possible, often lifting the burden from industry to science participants, or to newer industry participants.

Impacts and Applications:

Project results may be useful to government, fishing-related, scientific, and non-profit organizations engaged in ongoing fisheries regulatory arenas, coastal and marine policy, and community development.

Related projects:

This project is not formally associated with any other project or partnership. The two lead PIs have completed, or are completing, related projects, including doctoral dissertations.

Presentations:

The results of this project have not been presented publicly.

Student participation:

One of the industry PIs was a continuing education student, pursuing a M.A. at the University of Southern Maine. Both the lead science PIs were doctoral students during most of the project, at Clark and Harvard Universities.

Published reports and papers:

The results of this project have not been published.

Future Research:

Future research should include additional analysis of the port-specific datasets, comparative analysis of data produced by the two field sites, and possibly completion of the GIS.

Home Port Fidelity in the Groundfishery of Portland, Maine

Jennifer F. Brewer, Ph.D.¹

August 20, 2007

¹ Jennifer Brewer is currently employed at the National Research Council in Washington, D.C. This report, however, was initiated and completed independently, and has no relationship to any study conducted by the NRC.

Home Port Fidelity in the Groundfishery of Portland, Maine

Abstract

This report summarizes findings from research conducted in the Portland, Maine groundfishery. It is one of two reports produced by a larger collaborative project, the other summarizing findings from parallel research conducted in Gloucester, Massachusetts. The following pages review the historical and economic context of the Portland research, outline methods of data collection and analysis, report and interpret empirical observations, and discuss broader implications. The research was driven by questions emerging from a collaborative team of scientific and fishing industry investigators, incorporating a range of working hypotheses among project participants. These hypotheses were aggregated into two broad questions: How mobile or immobile are the individuals and boats invested in the groundfishing industry and home-ported in Portland? What factors might help to explain such patterns of mobility or immobility? Findings suggest that Portland home-ported groundfishing firms have very place-based histories, in multiple respects on both long and short time horizons. Crew seem to have somewhat more diversified histories of place-based decision making.

Context of the Study

Historical Context

The port of Portland is placed among dozens of smaller harbors scattered along the Maine coast, and a handful of larger and smaller ports in more southern New England states. Among other differences, the history of Maine's fishing harbors differs from that of most other New England states in the geographic dispersion that has patterned periods of industry growth and decline. Permanent groundfishing villages were established on Maine islands by 1607, mostly in the mid-coast area. Efforts to monopolize the fishing industry began as early as the 1620s, but legal bans on independent operators produced widespread protest, proved unenforceable, and were soon rescinded (Churchill 1995).

Measured in tonnage, western Maine dominated the state's distant water groundfishing fleet until the early 1800s (O'Leary 1996). By the start of the Civil War, however, almost half Maine's codfishing tonnage was owned in one down east county. By 1880, the situation had again reversed, with harbors in western Maine holding two thirds of the state's deep sea fishing tonnage (O'Leary et al. 1995). Portland emerged as a dominant port during this latter period, attracting investors from outside the state, and controlling state-wide markets for fish packing, shipping, and fishing gear. Vertical integration of processing and vessel ownership, as well as costly technological shifts from tub trawls to heavier net trawls, exaggerated the shift away from smaller harbors, drawing many smaller boats and crew from eastern Maine to Portland (O'Leary 1996).

Maine's fishing industry diversified in the 19th century. In addition to international and national markets for cod, new markets emerged for halibut, mackerel, pollock, hake, and haddock

(Vickers 1994; Lear 1998). In the late 19th and early 20th centuries, markets developed for herring, porgies, clams and lobster (Rathbun 1887; Johnson 1976; Lipfert et al. 1995; Acheson 2003). Later in the 20th century, lobster markets continued to rise, and new markets developed for additional species such as scallops, shrimp, mussels, quahogs, elvers and other finfish. These diversified markets sustained a more varied industry in Portland and other Maine harbors. In the 1970s and 80s, the mid-coast town of Rockland competed with Portland for status as the state's biggest fishing port, dealing primarily in groundfish but also supported by herring, scallops and other fisheries. The 1986 opening of the Portland Fish Exchange, the first all-display fish auction on the eastern seaboard, drew fish dealers, processors, and larger vessel owning firms to Portland from throughout the region, making it an active market hub. The high volume, high product quality, and price setting capacity of the Portland auction forced virtually all other Maine wharves to cease their groundfish buying operations. Since that time, the New England groundfish industry has undergone gradual but steady fleet shrinkage and geographic consolidation. Today, eastern Maine has few to no locally-based groundfishing operations. A handful of vessels groundfish out of mid-coast harbors, but rely heavily on markets in Portland and further south (Brewer 2007).

Economic Context

Among U.S. states in 2004, the dockside value of Maine's fisheries followed only the state of Alaska. Massachusetts placed a close third. The dispersed character of Maine's fishing industry is revealed when statewide data are broken down by port for the same year, however. Maine's highest earning harbor, Portland, ranked only 19th. Maine's second highest earning harbor that year, Stonington, ranked 32nd. By contrast, eight Alaska ports ranked in the top 20. Massachusetts had two of the top 20 ports, with New Bedford ranking first, and Gloucester 11th.

Figure 2: 2004 Top Ten State Fisheries Landings, Ranked by Landed Value
Source: National Marine Fisheries Service

<u>Rank</u>	<u>State</u>	<u>Value</u> <u>(\$ millions)</u>	<u>Weight</u> <u>(millions lbs.)</u>
1.	Alaska	1,202.5	5,354.6
2.	Maine	367.1	228.4
3.	Massachusetts	327.5	338.0
4.	Louisiana	274.8	1,096.5
5.	Florida	194.9	126.8
6.	Texas	166.2	85.6
7.	Washington	164.2	190.9
8.	Virginia	160.4	481.6
9.	California	137.4	373.4
10.	Oregon	101.2	294.9

Figure 3: Top Twenty Fishing Ports, Ranked by Landed Value
 Source: National Marine Fisheries Service

<u>Rank</u>	<u>Port</u>	<u>Value</u> (<u>\$ millions</u>)	<u>Weight</u> (<u>lbs. millions</u>)
1.	New Bedford, MA	207.7	175.4
2.	Dutch Harbor-Unalaska, AK	167.4	886.8
3.	Hampton Roads, VA	100.8	34.7
4.	Kodiak, AK	94.0	317.4
5.	Cape May-Wildwood, NJ	68.2	98.1
6.	Empire-Venice, LA	60.2	379.0
7.	Honolulu, HI	45.8	18.9
8.	Seward, AK	43.6	38.6
9.	Key West, FL	43.2	16.0
10.	Dulac-Chauvin, LA	42.8	40.4
11.	Gloucester, MA	42.8	114.1
12.	Naknek-King Salmon, AK	42.5	92.6
13.	Brownsville-Port Isabel, TX	40.3	18.7
14.	Sitka, AK	40.1	37.3
15.	Port Arthur, TX	38.9	19.4
16.	Homer, AK	37.1	18.1
17.	Petersburg, AK	36.1	102.6
18.	Point Judith, RI	36.0	50.0
19.	Portland, ME	34.6	62.4
20.	Cordova, AK	31.8	40.5

Although value-added numbers are hard to come by, revenues generated by commercial fishing probably comprise less than 1% of Maine's Gross State Product (Roach 1999). Today, lobster is responsible for about three quarters of Maine's fishing profits, with more than 67 million pounds bringing more than \$311 million at the dock in 2005. Salmon (farmed), groundfish and clams come in distant second, third and fourth place, each providing about 5% of total dockside profits. Herring and worms each comprise about 2%. Crabs, sea urchins, mussels, and quahogs each provide about 1%. Several other species make up a remaining 1%.

Regulatory Context

Many observers in fishing industry, scientific and environmental communities, blame regulation for groundfish declines in Maine and New England. The fishery has a complex regulatory history, which makes it difficult to pinpoint more and less effective regulatory policies. Throughout the 20th and 21st centuries, groundfish harvest controls have included gear restrictions (such as net mesh sizes), area closures (seasonally or year-round, and especially inshore), and minimum sizes for landed fish. Output restrictions in the form of catch quotas (calculated as aggregate catch for specific fleet subsectors over a specified period of time, not as individual catch quotas) were tried in the 1960s and 1970s. In the 1990s, vessel landing limits were set on a per trip basis and permit moratoriums were imposed for most of the fishery. Permits were denied for vessels unable to document minimum landings in specific years. Limitations on the allowed number of fishing days per vessel were set as annual "days-at-sea"

(DAS). DAS have since become a primary regulatory mechanism. Questions arise, however, as to the efficacy and impacts of this tool, with respect to both ecological and social-economic dimensions of the fishing industry.

Research Design

Collaboration in Quantitative and Qualitative Methods

Project participants had extensive prior experience in the sciences, fishing businesses, and fisheries policy/management arenas. We wished to fully utilize this existing foundation of collective knowledge, and scheduled numerous and extended opportunities for discussion throughout the development of research design and field data collection protocols. We spent some time discussing quantitative and qualitative methodologies, and determined that a combination of the two would yield the most robust and thoroughly supported project findings. The group considered multiple alternative sampling frames and survey formats before settling on the protocols described below. Those discussions included reviews of existing databases from both public and private sources.

Sampling Frames and Interviews

Multispecies Permit Holders

Survey interviews were conducted with a random samples of federal multispecies permit holders listing Portland, Maine as their vessel's home port. Permit holders were identified from a National Marine Fisheries Service (NMFS) database that had been updated by NMFS as of March 5, 2003. Letters explaining the project were sent to permit holding interviewees prior to contacting them. Although interviews were often difficult to schedule, many permit holders who committed to the interviews were then quite generous in contributing valuable time and information. A check for \$50 was mailed to each interviewee, in partial recognition of these contributions.

Interviews of permit holders listing Portland as their home port were completed during the period of July 2005 – March 2006. These totalled 20, with a response rate of 83%. These were completed by telephone by an industry PI, with close supervision from a scientist PI. Supplemental samples were taken as necessary to replace some permit holders who declined to be interviewed, or could not be contacted after many repeated attempts.

Crew

A sample of crew members was generated from a list of names given in interviews with multispecies permit holders listing Portland as their home port. These names comprised crew members on boats previously fished by permit holders (as boat owners, crew, or managers), during a series of years specified in the survey. (The series of years is discussed below, in the section on survey design.)

Crew members known to be deceased, crew already interviewed as permit holders, and duplicate crew referrals were removed from the list. A random sample was taken, plus supplemental samples as necessary to replace crew who were deceased, who declined to be interviewed, for whom contact information could not be found, or who could not be contacted after repeated attempts.

Twelve crew interviews were completed by an industry PI during the period of April 2006 - July 2006, with close supervision by a scientist PI, and a response rate of about 36%. Letters explaining the project were not sent to crew interviewees prior to contacting them, due to the difficulty of developing a reliable contact list in advance of crew contact attempts. Although crew members were more difficult to find and contact, for reasons discussed below, once contacted, most were generous in contributing both time and information. A check for \$50 was mailed to each interviewee, in partial recognition of these contributions.

Survey Design/Interviews

The two lead science PIs developed a draft survey instrument to collect both qualitative and quantitative information. The survey was based on extensive discussions with industry PIs preceding proposal development, during the course of proposal writing, and in multiple project meetings. The two industry PIs and the third science PI reviewed the survey draft, made comments, and corresponding revisions were made by the two lead science PIs.

The survey included questions about interviewees' personal fishing histories, and about activities and attributes of all boats with which the interviewee was affiliated during particular years of interest. In addition to basic documentation and descriptive information culled from the NMFS database, the survey asked about a dozen questions about the interviewee's personal background and fishing career. The survey also asked more than two dozen questions about each boat with which the interviewee was affiliated during each of five years of interest.

The years of interest were 1983, 1993, 2003 and (optionally) 1997 and 2004. The three primary years of interest were chosen to span the two decades preceding the intended beginning of survey data collection. Conveniently, they not only represent equivalent time periods, but coincide with major fishery management actions. 1983 was one year prior to implementation of the Hague Line. 1993 was the year before Amendment 5 to the federal multispecies Fishery Management Plan (FMP). 2003 preceded implementation of Amendment 13 to the multispecies FMP, and was the second year under which the multispecies fishery was managed according to a court ordered settlement agreement. The two optional years were chosen to achieve slightly better temporal resolution in the more recent decade. 1997 was the year multispecies Amendment 7 went into effect. 2004 was the first year Amendment 13 was implemented. In order to parallel changes in federal reporting, data collected for years 1983 and 1993 correspond to calendar years, while data collected for years 1997, 2003, and 2004 correspond to fishing years (starting May 1 of the listed year and ending April 30 of the following year).

Two versions of the survey were produced, with only slight modifications to accommodate anticipated differences between responses from permit holder interviewees and crew interviewees. Fewer than a half dozen survey questions were unique to permit holder or crew

surveys, with all other questions being identical. Surveys included both closed questions intended to elicit short answers, and open questions intended to elicit long answers.

Database Construction

Databases were constructed to aggregate the vast majority of survey replies, both quantitative and qualitative. Many qualitative survey responses were coded into categories, for subsequent analysis as nominally and ordinally scaled quantitative data.²

Initial data entry for the Portland database was conducted by an industry PI, with supervision by a science PI. The database was reviewed, corrected, cleaned, reorganized, and initially coded by a scientific PI, with assistance from the industry PI, and from an additional fishing family member. The database was then reformulated into several secondary databases by the science PI to enable more extensive statistical analyses.

Data Analysis

Quantitative Analysis

As discussed below, quantitative analyses of the Portland data included frequency tables and graphs, descriptive statistics, correlation matrixes, factor analyses, and regressions. Both parametric and non-parametric statistics were used.

Qualitative Analysis

Qualitative analyses primarily involved reviewing interviewee's responses to open-ended survey questions. It also incorporated extensive conversations with the industry interviewer, who offered frequent contextual comments informed by her experience as a fishing family member. Contextual information from prior research by the science PI was also considered, as were her personal and professional experiences living in fishing-dependent households, and working with fishing-dependent businesses and organizations.

Notes on Samples and Possible Related Biases

Permit Holder Sample

After much discussion of possible units of analysis, we designed our sampling frame to randomly select holders of 2003 federal multispecies permits.³ The federal database from which

² Ordinally scaled data generally represent rank orders (such as 1st, 2nd, etc.). This contrasts with integer scale data, which describes specific quantities with clear mathematical relationships among them (such as one boat, two boats, etc.). Nominally scaled data are numbers representing non-numerical categories (such as male, female, etc.).

³ We considered sampling boats, as the primary capital assets in most fishing businesses, but decided that this would be problematic, since boats are bought and sold over time and could be difficult to track down. Further, boats represent only the most tangible asset in a fishing firm, and are most profitable when the people running them contribute extensive ecological, technical, and business-specific knowledges. In most firms, permit holders are active decision makers when it comes to general business operations. In many firms, however, a hired captain or vessel manager may make many routine or highly strategic decisions, and may or may not be expected to consult

Our sample was drawn lists individual permits and affiliated contact persons, boats, and other specifics. Because some individuals or firms held multiple multispecies permits, they were more likely to be selected randomly from the federal permit holder database compared to individuals or firms holding only one multispecies permit.⁴ In fact, two individuals owning, part-owning or managing a number of fishing boats appeared twice in our sample. To complicate matters further, some permits were affiliated with boats that held them primarily for the purposes of leasing days-at-sea to other boats, owned by the same firm or a different firm. For these reasons, the present report generalizes more easily about permit holders and boat-years, and less easily about fishing boats, boat owners, or fishing businesses.

Our sample can be understood to represent individuals and firms with some ostensibly active interest in the groundfishery as of 2003. It does not necessarily represent active groundfishing firms or individuals. Some holders of multispecies permits maintain commercial groundfishing activities. Others do not. Some went commercially groundfishing in the past but do not have permits with sufficient DAS to continue in this fishery, or have left the fishery for other reasons. Some have never gone commercial groundfishing but might fish recreationally for some groundfish species. As noted above, in recent years, some individuals and firms hold permits and lease DAS to other firms. These variations in degrees of investment and activity in commercial groundfishing were considered and accounted for in data analyses and interpretations, as discussed in those sections below.

About half the businesses included in the Portland permit holder sample were incorporated. In some cases, these corporations are controlled entirely by the interviewed individual. In other cases, family members (including spouses, parents, children or others) are corporate partners. In yet other cases, some number of non-family business partners are involved. In all cases of corporate ownership, interviews were requested only from permit holding individuals listed in the NMFS database, or from individuals referred to at phone numbers listed for corporate permit holders in the NMFS database. In most cases of corporate ownership in the Portland sample, phone numbers listed were for private homes. Other corporate owners were not interviewed. Most interviewees did not voluntarily offer names of other corporate partners, except in some cases where they were immediate family members.

A concerted effort was made to contact and interview as many of the sampled permit holders as possible, even if it required multiple phone calls and repeated rescheduling. Once permit holders were able to set aside the necessary interview time, the vast majority were very forthcoming in their answers to most survey questions. Although some difficulties were encountered in the mechanics of data entry, multiple reviews of the data have eliminated those problems. For these reasons, we are confident in the randomness of the Portland dataset.

Crew Sample

frequently with the permit holder. It is also the case that when boats and permits are held by a corporation, permit holders may be reluctant to discuss decision making arrangements in any details. It should not surprise us that fishing operations are inherent social entities; it just makes for difficulties in parsing apart variables for quantitative data collection and analysis.

⁴ These duplicate permit holders could not be eliminated from the database prior to sampling because some held different permits under different corporate names. Further, the existing sample can be considered to reflect a level of industry consolidation that would be concealed if duplicate permit holders were removed.

Although the second set of Portland surveys is referred to here as a "crew" sample, this is something of a misnomer. It is difficult to obtain a random sample of crew members. Unlike permit holders, their names and contact information are not listed in publicly available databases. While many permit holders willingly provided names of crew members, some were reluctant to do so, or could not remember their names. We did not ask permit holders to check their records for crew names or contact information. Reasons for this were twofold: 1) most crew work on a contract, or lay, system, whereby boat owners divide profits from each trip and are not legally required to maintain employment records with names and contact information, and 2) we were reluctant to ask permit holders to expend additional time to check any existing records, especially those dating back several years.

Especially without checking any records, permit holders may have been more likely to recall names and contact leads for crew who worked with them over a longer time period, and/or more recently, compared to crew members who worked for a smaller number of trips and in the earlier years included in the survey. Further, some of the individuals in the crew sample were also multispecies permit holders themselves, either at the time that they worked as crew, or at some other time. Others may not have held multispecies permits, but owned commercial fishing boats that harvested other species.

It is possible that the Portland crew sample is biased toward individuals currently residing in the vicinity of Portland, Maine or New England, since contact information or leads were more likely to be known by referring permit holders, and more likely to be found easily in internet and word-of-mouth searches. Contact information could not be found for about a third of the crew sample, even after contacting family members and known previous residences.

Given the concerns stated above, the crew sample is not sufficiently large or representative to yield multivariate statistical analyses with high levels of external validity.⁵ The twelve sampled individuals were referred from only half of the permit holder sample. More than half of the twelve were referred from a total of just three permit holders. Nonetheless, the sample is useful for making at least a few qualitative comments, supported with univariate measures.

Quantitative Data Analysis

Measurement Scales and Statistical Tools

Several statistical analyses are summarized below. More detailed tables are provided in the appendix. A substantial amount of survey data on Portland permit holders comprised normally distributed integer scale data, allowing parametric descriptive and multivariate analyses. Data on Portland boat-years included a large number of ordinal and nominal scale variables, requiring nonparametric analyses, as well as integer scale variables, allowing parametric analyses.⁶ Crew

⁵ External validity refers to the extent to which observations based on a studied sample can be generalized to the larger population of interest.

⁶ Nonparametric statistics are "weaker" than parametric statistics in that they are somewhat less likely to detect meaningful relationships among variables. Parametric tools assume that variables are measured on an integer scale,

data was sufficient for tentative univariate analyses. The vast majority of statistics reported below are significant at $p < .05$.⁷

Portland Permit Holders

Descriptive Statistics

As a group, our sample of 2003 federal multispecies permit holders listing Portland as their home port are all male. They were born in a time period spanning from 1939 to 1976. They first fished at ages ranging between four and 29. They owned their first boat at ages ranging from nine to 41. They range from having no commercial fishing experience in their families, to being the fourth commercial fishing generation in their families. They hold federal commercial fisheries permits for from two to 11 different species or species groups. During the years of survey interest, they have participated in from one to four different fisheries, which may or may not include the groundfishery. They used from one to seven different harbors during the years of survey interest plus the harbor in which they first fished. They have used harbors in one to four different states and/or countries during the same time period.

Univariate statistical analysis enables us to say with 95% certainty that the average (mean) holder of a Portland based 2003 federal multispecies permit is male and was born between 1952 and 1960.⁸ He is a 1.4th to 2.6th generation fisherman, and first went fishing between the ages of ten and 16. He owned his first boat between the ages of 20 and 28. He holds 5.7 to 8.2 different kinds of federal commercial fishing permits (defined by species or species group),⁹ and participated in between 2.2 and 3.1 fisheries (generally as defined by federal permits for species or species group) during the years 1983, 1993, 1997, 2003 and 2004. He was active in the commercial groundfish industry during all of these years. He has used 2.4 to 3.8 harbors during these years (whether as boat owner, captain, crew or manager) plus the harbor from which he first learned to fish. He has used harbors in 1.7 to 2.4 states and/or countries during these same years, including where he first learned to fish.¹⁰ (For a more detailed report in table format, see Appendix, Figure 1.)

are normally distributed, and that sampled cases are randomly selected (though some parametric statistics are more or less tolerant to deviations from these assumptions). Datasets for which these assumptions cannot be met can sometimes be analyzed with nonparametric tools. Nonparametric tools are especially useful in social science, where small sample sizes are common, and many observations do not have integer values, but can be coded on an ordinal scale, by rank order.

⁷ P represents the statistical possibility that a given statistic, calculated from a random sample, is not representative of the larger population from which the sample was drawn. (Population here can refer to a group of people, or any group of objects.) For example, a p of .05 indicates a 5% probability that a statistic cannot be used to describe the larger population. Inversely, it indicates a 95% confidence level.

⁸ These means are stated as ranges to ensure validity at a 95% confidence level. Stating them as single number averages (such as "born in 1956") can misrepresent the measurement's precision, communicating a false sense of accuracy when generalizing to the larger population.

⁹ This counts merely different types of permits held. It does not count the total number of individual permits held, since one owner might hold or lease more than one permit in a single fishery, either fishing them on different boats, or stacking multiple permits for the same fishery onto a single boat.

¹⁰ For the purpose of the permit holder analyses, number of states/countries in fact represents only a number of states, as no non-U.S. countries were reported. In the crew sample, however, non-U.S. countries do appear.

Of the 20 interviewees, more than a quarter were born in Portland, more than half were born in southern or midcoast Maine, two were born elsewhere in New England, a quarter were born elsewhere in the U.S., and one was born overseas. A quarter of the interviewees grew up in families that fished out of Portland. More than a quarter grew up in families that fished out of other Maine harbors. A few grew up in families that fished in other states. Another quarter grew up in families that did not commercially fish. About half of the interviewees began their commercial fishing careers on lobster boats. More than a quarter of them first fished in Portland, three quarters of them first fished in Maine, another quarter first fished elsewhere in the U.S. More than a quarter of interviewees first fished in the same town where they were born, three quarters first fished in the same state where they were born. Fewer than a quarter first fished in states or countries different from where they were born. More than three quarters of the multispecies permits are on boats that hailed from Portland in 2003. Half the multispecies permits are associated with boats that hailed from the same harbor in which the interviewed permit holder first fished. All permit holders resided in Maine as of the interview date. About a quarter have worked for some period greater than a year outside the fishing industry. Almost a quarter of the interviewees were not employed in commercial fishing when the survey was conducted.

A small number of open-ended interview questions yielded data that is less conducive to statistical analysis, but assists in contextualizing and interpreting quantitative analyses. All 20 permit owners interviewed were asked the following question: "Have you moved around (or traveled) more or less than you would like in pursuing your fishing career? What kinds of things have caused you to move around or stay put?" Of the 20, five responded that they had moved and traveled more than they would like. Three responded that they had moved and traveled as much as they wished. None replied that they would have liked to move or travel more. Five responded that regulations had forced them to fish in different areas than they would otherwise. One responded that regulations forced him to target different species than he would otherwise. One responded that Maine's ban on landing dragged lobsters forced them to land in Massachusetts. One responded that the Portland auction is driving people to Massachusetts. One responded that he had made location decisions based on family considerations. Four responded with strong concerns about industry consolidation. Of these four, three complained that one firm is increasing its fishery access at the expense of others (all specifically and spontaneously naming the same single firm, and two specifically stating that permit purchases are the means of this consolidation), while one of the four also complained of a second firm doing the same.

Correlations

A Pearson's r correlation matrix revealed marked correlations between three pairs of permit holder characteristics.¹¹ The age at which permit holders first fished, as well as the age at which

¹¹ Correlations range between -1 and 1. A correlation of 0 would mean there is no association between the two variables. A correlation of 1 would mean that two variables are perfectly associated. A "marked" correlation is usually defined as a correlation greater than .6 or less than -.6. This means that more than 36% of the variation in each of the two correlated variables is associated with one another. A positive correlation indicates that high values of one variable are associated with high values of the other variable. A negative correlation indicates that high values of one variable are associated with low values of the other variable.

permit holders owned their first boat, correlated markedly (both negatively) with the number of species fished during the years for which survey questions were asked. The number of states/countries in which ports were used during the time periods for which survey questions were asked (including learning to fish and fishing activities in the years specified above) correlated markedly (positively) with the number of ports used during the same time periods. (See Appendix, Figure 2 for table.)

Factors

Five factor analyses were run on the permit holder integer data. Each used a different factor extraction method, and allowed up to four factors to be extracted, providing that any extracted factors have eigenvalues of at least 1.¹² Extraction methods included communalities, iterated communalities, maximum likelihood, centroid and principal axis.

Four factor methods each extracted two factors. One method (centroid), extracted three factors. The four methods extracting two factors each, produced cumulative eigenvalues that accounted for 49-51 % of total variance. The method extracting three factors produced cumulative eigenvalues that accounted for 67% of total variance.

In all five factor extraction methods, number of states/countries in surveyed years and number of fisheries participated in during surveyed years have marked factor loadings.¹³ In four of the five extraction methods, age first fished has marked factor loadings. In three of the five extraction methods, age owned first boat has marked factor loadings. In one extraction method, number of types of permits held has a marked factor loading. In all five factor extraction methods, number of fishing family generations, number of ports used in years surveyed, and year born have zero marked factor loadings. In the four two-factor extraction methods, all variables with marked factor loadings have eigenvalues between 1.8 and 2.3. In the one three-factor extraction method, all variables with marked factor loadings have eigenvalues between 1.3 and 2.2. (See Appendix, Figure 3 for tables.)

Regressions

Four regressions were run on Portland permit holder data to explore the extent to which measured permit holder variables might explain number of ports used during the periods of interest, number of states/countries in which ports were used during the periods of interest, number of federal permits held, and number of federally permitted fisheries participated in during the years between 1983 and 2004 specified in survey questions.

¹² Factor analysis can be used to explore the “dimensions” or underlying structure of a dataset by identifying groups of interrelated variables, as in this application. Factor analysis can also be used to reduce a large number of variables to a smaller, more manageable number of variables, for further analysis. Although factor analyses usually recommend larger datasets, with at least five cases for each extracted factor, similar results from five different factor extraction methods used here suggest that these analyses may be sufficiently robust. An eigenvalue represents the amount of variation among cases that is explained by each extracted factor. An eigenvalue of one represents the same explanatory usefulness as a single original variable in the dataset, and may not add significantly to data interpretation. Factor extraction methods differ in how they calculate relationships among variables.

¹³ Factor loadings represent the correlation between a variable and a factor. Here, loadings of .7 or higher are considered marked.

The regression for number of ports yielded an adjusted R^2 of .39.¹⁴ Beta weights were significant for two independent variables: 1) number of states/countries in which primary and secondary ports were used during the periods of survey interest (positive association), and 2) age at which he first owned a boat (negative association).¹⁵

The regression for number of states/countries in which ports were used during the periods of survey interest yielded an adjusted R^2 of .69. Beta weights were significant for three independent variables: 1) number of types of federal permits (positive association), 2) age at which he owned his first boat (positive association), and 3) number of states/countries in which primary and secondary ports were used during the survey time periods (learning to fish, plus five years between 1983 and 2004) (positive association).

The regression for number of fisheries participated in yielded an adjusted R^2 of .68. Beta weights were significant for two independent variables: 1) age at which he first went fishing (negative association), and 2) age at which he owned his first boat (negative association).

The regression for number of types of permits held yielded an adjusted R^2 of .63. Beta weights were significant for three independent variables: 1) number of states/countries in which primary and secondary ports were used (positive association), and 2) age at which he owned his first boat (negative association), and 3) year he was born (negative association). (See Appendix, Figure 4 for tables.)

Groundfishing Boat-Years

The analyses below are based on data reported for years 1983, 1993, and 2003. Although data was also collected for years 1997 and 2004, including those years could bias the results toward more recent years. Further, data collection for those years is missing a larger number of datapoints, since the survey designated responses for those years as optional.

¹⁴ R^2 is a number between 1 and 0 that describes the amount to which the variation in a dependent variable is reduced by (or might be explained in terms of) the independent variables included in the regression. An R^2 closer to 1 means that more of the variation in the dependent variable might be accounted for by the independent variables included in the regression. An R^2 closer to 0 means that less of the variation in the dependent variable might be accounted for by the independent variables included in the regression equation. R^2 is usually "adjusted" to account for "degrees of freedom" in the dependent and independent variable. Because R^2 is the square of a ratio of unaccounted for to total variation, even if the ratio is as high as .9, R^2 would only be .81, and is usually reduced further when adjusted for degrees of freedom (because this process entails dividing both the unexplained and total variation). Similarly, a if the ratio of .5, with half the total variation explained by the regression equation, and half remaining as unaccounted for, or "residual" variation, would yield an R^2 of .25, which might be reduced further after being adjusted.

¹⁵ The beta weight for each independent variable explains the extent to which that individual independent variable accounts for the total variation in the dependent variable. Beta weights are "semi-partial" coefficients and differ from "partial" coefficients (such as Pearson's, Spearman's and gamma coefficients discussed above and below) in that beta "controls for" other independent variables in the regression equation. Beta weights measure the unique influence of a single independent variable after distinguishing such influence from that of other independent variables in the regression equation. Partial coefficients do not distinguish between influence unique to a single independent variable, and influence shared with other independent variables listed in a correlation matrix. Beta weights are generally reported as significant when they are higher than .5 or lower than -.5.

Descriptive Statistics

Data was analyzed for 61 fishing boat-years reported by 2003 permit holders to be actively fishing during the years 1983, 1993 and 2003.¹⁶ As a group, the boat-years associated with 2003 permit holders during the years 1983, 1993 and 2003 ranged in number from zero to four boats per individual. The number of boats owned by individual per year ranged from none to three. Boat lengths ranged from 12 to 120 feet. Number of crew per trip ranged from none to ten. Trip length ranged from one to 16 days. Closest distance fished from shore ranged from zero to 180 miles. Farthest distance from shore ranged from zero to 300 miles. Number of species fished per boat-year ranged from one to six.¹⁷ Number of primary and secondary ports used per boat-year ranged from one to three.¹⁸

On average, each permit holder reported owning one boat per year, and working on or managing one boat per year. With a 95% confidence level, the mean year fished was between 1992 and 1996. The mean number of boats fished was 1.5 to 1.9. The mean number of boat owned was 1.0 to 1.3. The mean boat length was 60 to 72 feet.¹⁹ The mean maximum number of crew was between 3.5 and 4.1. The mean longest trip was between 4.9 and 6.7 days. The mean closest to shore fished was between 13.8 and 38.1 miles. The mean farthest from shore fished was between 98.7 and 140.1 miles. The mean number of species per boat-year was between 1.6 and 2.1. The mean number of primary and secondary ports used was between 1.3 and 1.6. (See Appendix, Figure 5 for tables.)

Ordinally and nominally ranked survey responses provide less precise information about metrics that are more difficult to measure using an integer scale. Calculated on the basis of 61 boat-years, more than half the boat-years were associated with permit holders maintaining permanent residences in southern or mid-coast Maine.²⁰ In thirteen boat-years, the interviewed permit holder maintained a permanent residence in Portland, in an additional 35 boat-years, the interviewed permit holder maintained a permanent residence in southern or mid-coast Maine, in

¹⁶ Permit holders provided data for a few more boat-years that were excluded from the analysis either because the boat was not fishing in those years, or data was insufficient to analyze. Boat-years reported by crew were excluded because the sample was not sufficiently random and many duplicated boat-years reported by permit holders (since permit holders were the reference source from which the crew sample was created). Boat-years for which fishing occurred only on species other than groundfish were included in the analysis, but coded separately to allow analysis of the impact of this variable on others.

¹⁷ Commercially fished species other than groundfish included shrimp, scallops, lobster (all mentioned with some frequency), and whiting, monkfish, hake, tuna, herring and mackerel (each mentioned by only one or two permit holders).

¹⁸ This statistic aggregates all harbors reported as primary or secondary ports used for tie up, landing, and sale. Note, however, that this does not necessarily reflect the total number of harbors used by each boat. Surveys only asked for primary and secondary ports. In many cases, these two levels of use incorporated all ports used. Some boats, however, used more than two ports for tie up, landing, and/or sale.

¹⁹ Two boat-years were reported for boats 12' in length, one for a boat 20-29' long, four for boats 30-39' long, nine for boats 40-49', seven for boats 50-59', three for boats 60-69', 14 for boats 70-79', 13 for boats 80-89', three for boats 90-99', and four for boats 100-120'. The median was 70', with half the boats exceeding 70 feet and half smaller.

²⁰ Note that the associated permit holder is someone who held a permit in 2005 and therefore appears in our sample and reported fishing activities for that boat-year as owner, crew, or manager. It is not necessarily the person holding the groundfishing permit actively used by that particular boat in that particular year. Permit holders reporting data for multiple boat-years are counted per boat-year in this analysis, not as single individuals.

five boat-years, the interviewed holder maintained a permanent residence in inland Maine, in four boat-years, the interviewed permit holders maintained a permanent residence elsewhere in New England, and in two boat-years, the permit holders maintained a permanent residence outside New England. Only in two boat-years did any respondent maintain a temporary residence different from his permanent residence.

Two thirds of the boats tied up primarily in Portland (66%). About a fifth of the remaining boats tied up primarily in Maine (17%). The remaining fifth tied up elsewhere in New England (10%) or outside the region (6%). Almost half reported Portland as being their secondary tie up (44%). Another quarter reported secondary tie ups elsewhere in Maine (28%). The remaining quarter reported secondary tie ups elsewhere in New England (23%) or outside the region (3%). Similarly, two thirds landed fish primarily in Portland (70%). A handful landed fish primarily in other Maine ports (8%), and the remaining fifth landed primarily elsewhere in New England or outside the region (18%). More than half reported Portland as their secondary landing port (56%), with a fifth landing secondarily elsewhere in Maine (11%), and a remaining quarter landing secondarily elsewhere in New England (26%) or outside the region (3%). Again, two thirds sold fish primarily in Portland (69%), with another handful selling elsewhere in Maine (9%), and a fifth selling elsewhere in New England or outside the region (18%). Half reported Portland as their secondary sale port (49%), with a fifth selling secondarily elsewhere in Maine (13%), a third selling secondarily elsewhere in New England (30%) and a handful selling secondarily outside the region.²¹

Grounds reported fished in these boat-years included the Gulf of Maine, Georges Bank, and elsewhere on the east coast of the U.S. and Canada. Almost half of the boat-years reported fishing only or mostly in the Gulf of Maine (43%). Most of the remaining half reported fishing in the Gulf of Maine, Georges Bank and elsewhere in New England (41%). A few (5%) reported fishing grounds beyond New England, such as the Grand Banks or mid-Atlantic waters.

Correlations

A gamma correlation matrix revealed strong, very strong or perfect correlations between 35 pairs of boat-year characteristics.²² Permanent residence correlated perfectly with temporary residence. Both permanent and temporary residences correlate very strongly with primary landing port, and primary sale port, and correlate strongly with primary tie up port, and secondary landing port. Primary landing port correlates perfectly with primary sale port. Both primary landing port and primary sale port correlate very strongly with secondary landing port, and strongly with secondary tie up port and secondary sale port. Primary tie up port correlates very strongly with primary landing port and primary sale port, and correlates strongly with secondary tie up port, secondary landing port, and secondary sale port. Secondary tie up port

²¹ Some respondents reported Portland to be their primary and secondary tie-up port, primary and secondary landing port, and primary and secondary sale port.

²² Gamma correlations are a nonparametric alternative to Pearson's r correlations. They differ from Pearson's r in that they tolerate ordinal and integer data, non-normal variable distributions, and ties among variables. Gamma statistics range between -1 and 1. A correlation of 0 would mean there is no association between the two variables. A correlation of 1 would mean that two variables are perfectly associated. A "strong" association is usually defined as a correlation of .6 or higher, or -.6 or lower. A "very strong" association is usually defined as a correlation of .75 or higher, or -.75 or lower.

correlates very strongly with secondary landing port and secondary sale port. Secondary landing port correlates very strongly with primary sale port and secondary sale port. Secondary sale port correlates strongly with number of ports for that boat-year. (All of these are positive associations. See Figure 6 in the Appendix for tables.)

Factors

Five factor analyses were run on the three years of boat-year data. Each used a different factor extraction method, and allowed up to four factors to be extracted, providing that any extracted factors have eigenvalues of at least 1.²³ Extraction methods included communalities, iterated communalities, maximum likelihood, centroid and principal axis.

Four factor methods each extracted one factor. One method (centroid), extracted three factors. The four methods extracting one factor, each produced cumulative eigenvalues that accounted for 32-33 % of total variance. The method extracting three factors produced cumulative eigenvalues that accounted for 55% of total variance.

In all five factor extraction methods, variables for boat length, maximum number of crew, and longest fishing trips have marked factor loadings. Variables for number of boats owned and number of ports used per year join that list in the centroid extraction of three factors.

Regressions

Two regressions were run on the three years of integer scale Portland permit holder boat-year data to explore the extent to which a series of boat-year variables might explain the number of ports used per year and the number of fisheries participated in per year. The adjusted R² for number of ports used was .14. The adjusted R² for number of fisheries participated in was .04. In the regression for number of primary and secondary ports used, only maximum number of crew had a beta weight approaching .5. In the regression for number of fisheries participated in, all variables had beta weights well below .5. (See Figure 8 in Appendix.)

Dummy variables were then added to include additional variables for which survey responses could not be easily measured on an integer scale. Five regressions were run, for dependent variables year, number of ports reported per year, permanent residence in Portland, an aggregate score for landings and sales ports, grounds fished, and boat length. Corresponding adjusted R²s were .3 for year, .5 for number of reported ports, 1.0 for permanent Portland residence, and .9 for landings and sales ports, grounds fished, and boat length. (See Figure 9 in Appendix.)

²³ Factor analysis can be used to explore the “dimensions” or underlying structure of a dataset by identifying groups of interrelated variables, as in this application. Factor analysis can also be used to reduce a large number of variables to a smaller, more manageable number of variables, for further analysis. Although factor analyses usually recommend larger datasets, with at least five cases for each extracted factor, similar results from five different factor extraction methods used here suggest that these analyses may be sufficiently robust. An eigenvalue represents the amount of variation among cases that is explained by each extracted factor. An eigenvalue of one represents the same explanatory usefulness as a single original variable in the dataset, and may not add significantly to data interpretation. Factor extraction methods differ in how they calculate relationships among variables.

Beta weights with absolute values over .5 for year included (in order of absolute value of weight) aggregate tie up score, secondary tie up Portland, number of boats owned, aggregate landing and sale ports, fishing grounds, permanent Maine residence, and secondary tie up in Maine.

Beta weights with absolute values over .5 for number of ports included (in order of absolute of value) aggregate tie up score, secondary tie up Portland, primary tie up Portland, farthest distance from shore, fishing grounds, permanent Portland residence, primary tie up in Maine, number of boats reported, Casco islands affiliation, longest trips, primary tie up New England, secondary tie up Maine, permanent residence southern or mid-coast Maine, number of boats owned, and permanent Maine residence.

Beta weights with absolute values over .5 for aggregate landings and sale score (in order of absolute value) included longest trips, primary Portland tie up, permanent Portland residence, farthest from shore, boat length, and boats reported.

Beta weights with absolute values over .5 for permanent Portland residence (in order of absolute value) included aggregate tie up score, primary tie up Portland, longest trips, farthest from shore, number of boats reported, fishing grounds, boat length, secondary tie up Portland, permanent residence southern or mid-coast Maine, Casco Bay islands affiliation, and number of boats owned.

Beta weights with absolute values over .5 for grounds fished (in order of absolute value) included aggregate tie up score, primary tie up Portland, farthest from shore, longest trips, secondary tie up Portland, permanent Portland residence, number of boats reported, and Casco Bay islands affiliation.

Beta weights with absolute values over .5 for boat length (in order of absolute value) included longest trips, primary tie up Portland, permanent Portland residence, farthest from shore, aggregate tie up score, number of boats reported, permanent residence southern or mid-coast Maine, fishing grounds, number of boats owned, Casco Bay islands affiliation, and aggregate landing and sales ports.

Crew

As noted above, without a larger and more representative sample, analysis of crew data is necessarily limited. Within these parameters, it does provide some rather suggestive information, however. Interviewed crew were all male. The birth year for crew interviewees ranges between 1949 and 1978, with a mean between 1954 and 1965.²⁴ The age of first fishing activity ranges from 8 to 30, with a mean between 15 and 23. They are members of first to third generations of fishing families, with a mean of 1 to 2. They participated in a range of one to five fisheries during the years of survey interest, with a mean of 1.6 to 3.4. They used a range of one to 12 ports during the years of survey interest (including where they learned to fish), with a mean of 1.8 to 5.4. Those ports were located in a range of one to 11 states or countries, with a mean of .8 to 4.3. States and countries reported included ports as far away as Alaska, Latin America and

²⁴ These are reported within 95% confidence levels.

Africa, although most non-New England ports were reported by a small number of interviewees with well-traveled histories. (See Figure 10 in the Appendix.)

A quarter of the “crew” interviewees were boat owners at some time. Three of the 12 owned boats at the time of the interview, one more had owned a boat previously. Two of these reported specific groundfishing or other fishing activities for boats they owned, the other two did not.²⁵ Thus, in the years of survey interest, two crew interviewees held positions as owner-operators, as well as holding other positions on other boats. Five other interviewees held positions as captains, as well as other crew positions, in the years of survey interest. Five interviewees worked only as mates, deckhands, cooks, or other crew in these years.

Crew were asked more open-ended survey questions than permit holders. Like permit holders, they were asked “Have you moved around (or traveled) more or less than you would like in pursuing your fishing career? What kinds of things have caused you to move around or stay put?” They were also asked about whether or not they had taken or turned down fishing jobs based on location considerations, how far they have traveled from a permanent or temporary residence for a fishing job, details about those decisions and outcomes, and advice for prospective crew and boat owners.

Three quarters of the crew interviewees responded that they had moved around as much as they wanted. Two responded that they had moved around more than they would like. None responded that they would have liked to move more. Three quarters reported making job related decisions in order to stay in Maine. Several mentioned turning down fishing opportunities outside Maine. Three quarters recommended that prospective crew members pursue a different occupation, most referencing poor prospects for career futures in the fishing industry at present. Two expressed optimism that crew jobs will improve in the future. Two noted that crew should be careful in their spending habits, and two mentioned a need for health insurance or other benefits.

Discussion

Different project participants approached data collection and analysis with slightly different working hypotheses. In the case of Portland data collection, these hypotheses were aggregated into two broad questions: 1) How mobile or immobile are the individuals and boats invested in the groundfishing industry and home ported in Portland? 2) What factors might help to explain such patterns of mobility or immobility? Factors preliminarily identified by project participants that might affect mobility or immobility included family and social ties, fishing regulations, markets, species diversification, capital investment, information networks, and other dimensions of household and business strategies.

Characterizing Permit Holders

²⁵ Fishing activities for one boat including groundfishing and several other fisheries. Activities for the other boat were limited to the tuna fishery. The other boats likely participated in commercial fisheries, but for shorter periods that were not encompassed by years of survey interest.

It is important to recognize that our picture of Portland home-ported permit holders is a snapshot, limited in temporal and spatial dimensions. Since the beginning of data collection in 2005, regulatory and ecological changes have caused some permit holders to sell their boats or permits, lease their permits, or shift their effort to other fisheries. There are many boats and fishermen landing, selling or tying up in Portland who did not claim it as their home port in 2003 and are therefore excluded from our sample. A few such boats are home-ported to the south, including Gloucester. Others claim home harbors as close as the Casco Bay islands, or as far east as Eastport. Some such boats have always visited Portland, whether for a wider range of services and products, better prices, or convenience. In recent years, however, as regulatory and ecological changes have consolidated the groundfish industry, Portland has become virtually the only Maine harbor in which groundfishing boats can sell their catch and buy necessary supplies. Without access to markets and fish stocks closer to home, some boats home-ported in other Maine harbors now tie up regularly in Portland. Conversely, some number of boats home-ported in more southern states formerly conducted some activities in Portland, but are now less likely to do so because of a reduced auction schedule and fewer shoreside services.

It is also important to recognize that some variables occur with greater or lesser variation within the study sample. For any give variable, it is often as important to recognize the breadth of variation across individuals surveyed, as to recognize the precise measurement at which individual measurements for that variable converge.²⁶ For example, none of the permit holders surveyed are female. That is a remarkable level of homogeneity, which deserves some comment (and qualification, as discussed below in relation to family ownership patterns of Portland fishing businesses). By contrast, within the 95% confidence parameters, we can only say that the mean holder of a Portland home-ported 2003 federal multispecies permit holds federal permits for a total of somewhere between 5.7 and 8.2 different fisheries. Although the average for this sample can be expressed as a single number, due to wide variation in our sample, if we want to be 95% confident that we are not misrepresenting the population as a whole, we can't say precisely what the mean is for the population of Portland home-ported 2003 multispecies permit holders as a population -- just that it is somewhere between 5.7 and 8.2.

Characterizing Boat-Years

Boat-year factor analyses suggest that boat length, crew numbers and fishing trip lengths are dominant variables in structuring the boat-year data. This is unsurprising, since bigger boats can travel to deeper and more distant waters, can hold more fish before returning to port, and can employ larger crews. A more detailed analysis, including clustering techniques, might yield a more nuanced description of variation within this dataset.

The Power of Place

One of the most striking patterns in the Portland permit holder data is the degree to which individuals and their fishing operations are "place-based." Gloucester, other New England states, Alaska, and more distant locales do appear in the dataset. Nonetheless, more than three quarters of the permit holders began their fishing careers in Maine, and three quarters began their

²⁶ The extent of the sample's variation from the mean can also be expressed as a standard deviation. These are more difficult to interpret in real-world terms, however.

fishing careers in the same state they grew up in. More than half come from families with commercial fishing backgrounds. Permit holders lived outside Maine for fewer than a third of the reported boat-years, almost none took up temporary residences to accommodate fishing activities during the years of interest, and all live in Maine as of the date they were interviewed.

Even though some permit holders have used several harbors during the period of interest, on average these harbors are in two or two and a half states, with those states being Maine and Massachusetts in the vast majority of cases. Clearly Portland-based fishing businesses utilized other ports, but they were remarkably consistent in returning to Portland, or to smaller Maine harbors. For a large minority of boat-years, Portland was reported to be the primary tie up, secondary tie up, primary and secondary landing port, and primary and secondary sale port. It would appear that in these boat-years, no ports other than Portland were used. A sizeable minority of boat-years used both Portland and another Maine harbor. A smaller number used Portland and another New England port. It is notable that boats were more likely to use a non-Maine port for landing and selling than for tying up, suggesting that when Portland boats land and sell elsewhere in New England, they have been likely to return to Maine between trips.

Perhaps by way of explanation, half the permits sampled are on boats that in 2005 hailed to the same harbor in which the permit holder owner learned to fish more than two decades prior. Portland-based permit holders seem to be exceptionally rooted in Portland and nearby Maine towns. None of the permit holders or crew members expressed a desire to travel more than they had done, and several expressed a desire to stay closer to home in Maine. In light of this discussion, it may not be surprising that fishing grounds reported by interviewees were mainly split between the Gulf of Maine and New England waters more generally. Fishing more distant waters would likely require moving other fishing operations away from Maine, at least temporarily.

Change Over Time?

To complicate the picture painted above, the place-based focus of Portland's groundfishing fleet may be changing somewhat. Boat-year regressions for year as a dependent variable did yield apparently significant beta weights for aggregate tie up score, secondary Portland tie up, number of boats owned, aggregate landing and sale ports, fishing grounds, permanent Maine residence, and secondary Maine tie up. This would initially seem to support the argument that in more recent years, boats have tied up in more places farther from Portland, have become more likely to tie up in places other than Portland, are owned by firms owning more boats, are more likely to land and sell product in places other than Portland, are more likely to fish farther from the Gulf of Maine, are less likely to live in Maine, and are less likely to tie up in Maine. The adjusted R^2 of this regression, however, (the amount of variance in the dependent variable year explained by the independent variables) is only .33. In other words, these apparent changes may be occurring, but not necessarily at significant levels, or in ways that were detected by our research design.

Further, regressions suggested no significant relationship between year of operations and indicators of spatial mobility such as number of ports used, or number of states/countries in which ports were used. It may be that Portland-based boats are not becoming more mobile overall, but that some activities are shifting slightly away from Portland and Maine. More

detailed quantitative and qualitative scrutiny of the existing data, and possibly additional data collection, may be warranted since this issue is one voiced frequently by industry members and others interested in the future of working waterfronts of Portland and Maine more generally (Groundfish Task Force 2004). It is likely that a more vivid and detailed picture of changes over time could be described if a second, complementary sample of permit holders were interviewed – one comprising multispecies permit holders in some prior year, such as 1983.

Business Ownership and Management

Prior to beginning field research, it was apparent to project participants that although the stereotypical groundfish boat owner may be a single person or nuclear family, some boats are owned by corporations, in which any number of family members or other non-family associates may have some percentage ownership. It was also apparent that some individuals or corporations owned one boat, while others owned multiple boats, perhaps with different co-owners. Indeed, number of boats owned per permit holder, as reported by boat-year, scarcely exceeded a mean of one boat. Interview responses complicated this picture, however.

Two permit holders spontaneously described themselves as boat “managers” for specified boat-years, clearly defining this role as independent from boat ownership or skippering. One of the permit holders identified himself as a manager, part owner, and sometimes skipper for four boat-years, and as a manager and small shareholder in one boat-year. Another permit holder identified himself as a manager and not as an owner in six boat-years. No manager roles were reported for boat-years in 1983, only in years 1993 and later. Thus it would appear that there are Portland-based vessels that are largely managed by people other than their owners and captains. This presence of professional fishing operations managers is surely not new to New England fishing industry, but it suggests that the financial context in which Portland’s groundfishing fleet operates may involve a level of corporate organization and capital access greater than we had previously assumed. Both boat managers reported being an owner or captain in several other boat-years, so these individuals have been personally involved in the industry for many years, and in diverse roles.

Fishery Entry

The number of fishing generations in a permit holder’s family does not appear prominently in any of the analyses undertaken. Nor did regressions yield significant relationships between permit holder age and variables relating to spatial mobility. Instead, age of fishery entry and boat ownership merit further consideration. Both appear as prominent variables in permit holder factor analyses. Regressions show that age of first boat ownership has a significant negative influence on the dependent variables numbers of states/countries used, and number of species fished.²⁷ That is, permit holders who entered the fishing industry at a younger age seem to have participated in more fisheries, and used ports in more states/countries.²⁸ It may be that a younger age of fishery entry simply provides more possible years of fishing activity, and thus more

²⁷ Beta weights also figure in the regression for numbers of ports used, but with a total adjusted R^2 of only .4, compared to adjusted R^2 s of .7 for the other two regressions.

²⁸ Because the variable of birth year was also included in these regressions, influence attributed to age of entry is distinguished from any influence by present age.

opportunities to enter a number of fisheries and travel to more distant ports. While this may seem to be an obvious statement, it does have some broader bearing. People who settle on a fishing career early in life are likely to have more future fishing options. People who enter fishing later in life may not encounter the same range of opportunities. This may have some bearing on the crew discussion below, since crew interviewees started fishing a few years later in life than permit holders. It may also have some bearing on the social and family environment in which one initiates a fishing career. Even if it might not matter how many past generations of one's family went fishing, the immediate presence of other fishermen during one's young adulthood may indeed matter.

Species Diversity

It was originally hypothesized by some project participants that species flexibility may be an alternative business strategy for individuals preferring not to diversify geographically. Although the data does not disprove this hypothesis, it does nothing to support it. Nonetheless, it may be notable that Portland home-ported 2003 multispecies permit holders hold a mean of six to eight federal permits, but participated in a mean of only two or three fisheries during 1983, 1993 and 2003. Additionally, half of the permit holders reported beginning their fishing careers in the lobster industry. Number of species/fisheries fished figured prominently in factor analyses intended to structure and characterize the permit holder data.

One explanation is that as regulatory barriers to fishery entry continue to rise in virtually all fisheries, it is in the interest of fishing firms to renew any permits they can imagine possibly using in the future. It is also true that multispecies permit holders who did not groundfish year round in past years were more likely to be eliminated from the fishery through regulations based on historical groundfish landings. Many boats participated in the groundfishery during some of those years, or seasonally for many years, but were forced out of the fishery because their historical landings were lower than others'.

Further, the regression for the dependent variable number of different permits held yielded significant beta weights for number of states/countries (positive), age owned first boat (negative), and year born (negative). Individuals whose fishing activities have been more geographically dispersed hold more different kinds of permits. It may be that they hold permits in some fisheries with fish populations or ex-vessel markets that are concentrated in waters and ports farther afield. Implications for the relationship between age of first boat ownership and number of permits are likely similar to those discussed above for number of fisheries participated in.

It is interesting that older individuals hold more different permits. One might have assumed that as permit holders age, and have fewer years left in which to fish, they would be less likely to renew unused permits. Younger permit holders might be expected to renew a larger number of permits to retain a larger number of future business options. The inverse seems to be true, and a more nuanced explanation is apparently needed. It may be relevant that older permit holders were more likely to enter fishing at a time when open access permits were available to any applicant at low cost. These individuals may have simply retained a number of permits they had held for years, by renewing them annually. By contrast, younger permit holders are less likely to have started fishing during the years of open access permit issues, and have spent more of their

careers in the regulatory environment of limited entry, DAS cuts, and high market prices for many fishing permits. Permit purchases present a cost barrier to the accumulation of numerous permits, especially ones that might not be used.

This statistic linking age to diversity of permit holdings also seems to support observations made by a few interviewees (both permit holders and crew) that “we all” used to fish for more species, generally blaming regulatory constraints for narrowed species harvest options. This argument is heard frequently in more easterly parts of Maine, and often from smaller boat owners in the mid-coast and western parts of the state (Brewer and Alden 2003; Brewer 2007). Older permit holders spent most of their careers in a regulatory climate in which they were permitted more inter-species flexibility. Younger fishermen feel intense pressure to maximize their landings in a given fishery, to retain days-at-sea in the event of future DAS cuts, and to return investments in purchased fishing privileges. Maximizing effort in a single fishery is likely to generate more specialized business strategies (Brewer 2007). Making more confident statements about this apparent trend would require further research.

Crew

Compared to permit holders, crew seem to be slightly older and started fishing a few years later in life. The number of ports they have used, and the number of states and countries in which those ports are located, vary more widely than for permit holders. This is not to say that on average they have used more ports, or in more states/countries. While the upper range of the 95% confidence levels for crew ports used and states/countries are 5.4 and 4.3, compared to upper ranges for permit holders of 3.8 and 2.4, the lower range of the same confidence levels for crew are 1.8 and .8 compared to lower levels for permit holders at 2.4 and 1.7. The extent of variation in the crew sample is much higher than in the permit holder sample. Since the ranges of permit holder means at the 95% confidence level fall within the ranges of crew means, no statement can be made as to whether crew on average use more or fewer ports, or ports in more or fewer states/countries.²⁹ To the extent that some crew may have more spatially varied fishing histories compared to permit holders, other crew have less spatially varied fishing histories compared to permit holders.³⁰

Crew seem to face no dearth of crewing opportunities outside Maine. Many mentioned turning down jobs in order to remain close to home. Some described particular aspects of Maine fisheries that appeal to them, including what one described as a uniquely Maine phenomenon of fishermen bringing their sons down to the waterfront to learn about fishing. Others described fishing in places as distant as Alaska and Africa, but eventually settling in Maine. Without a larger dataset, however, it is difficult to generalize from this sample, or to construct detailed comparisons with Portland-based permit holders. It might at least be surmised that fishing crew enjoy a very fluid job market. Because they can change jobs easily, crew members seem able to accommodate their personal preferences with respect to frequent travel, relocation or maintaining a stable residence.

²⁹ At a lower confidence level, such statements become possible, but are at greater risk of being incorrect.

³⁰ Only the clearest and most statistically defensible observations can be made about crew due to relative non-randomness of the crew sample, as discussed above.

Notable Absences

Fishing Activities Outside New England

It is worth noting some negative findings, or findings of absent relationships. Few to none of the 2003 permit holders reported significant fishing activities beyond the U.S. east coast in the boat-years of interest, and few reported any fishing outside New England. This is certainly an indicator of place-fidelity, but it may also indicate that primarily permit holders with more continuous New England groundfish landings histories can be expected to hold 2003 permits. Many previous permit holders who did not maximize their groundfish landings in recent decades were eliminated from the fishery through entry limitations and cuts in DAS. Given current ecological and regulatory conditions in the fishery, few individuals without New England groundfishing histories would be likely to purchase groundfish permits.

Eastern Maine

The virtual absence of eastern Maine harbors in interviewee responses is somewhat suggestive. None of the permit holders were born in eastern Maine or indicate living there at any time. Rockland and other mid-coast harbors appear roughly a half dozen times in the boat-year data, mostly as secondary tie ups. The only mention of eastern Maine harbors is one mention of Stonington as a secondary tie up. A couple of boat-years do mention working some down east fishing grounds. Eastern Maine is several hours from Portland by land, and might be assumed to have few socio-economic ties with the Portland/western Maine groundfishing industry. It may be, however, that surveying the few holders of 2003 groundfishing permits home-ported in eastern Maine harbors would yield a greater number of socio-economic links to western Maine, or perhaps to elsewhere in New England, especially in past years when groundfishing was an active enterprise in that part of the state.

Families

A comment should be offered on gender, families and business ownership. Although one or two permit holders mentioned their wives as boat co-owners, and several mentioned fathers, sons and other male family members as boat owners, mentors, and crew, the vast majority did not mention any female business partners. Permit holders were not asked specifically about wives' participation in their businesses, and doing so might have yielded a slightly different picture of fleet ownership and management. Female family members have traditionally played important roles in some groundfishing businesses, as bookkeepers, managers of shoreside operations during fishing trips, crew, part-owners, and partners in decision making. Even in families where women are not actively involved in the fishing business, some wives are named as co-owners on legal documents. An interesting question for further research is the extent to which family members' contributions enable or encourage place-based fishing business strategies. Related questions arose in the earliest stages of project proposal development, but were discarded in efforts to narrow and focus research questions. Although only a few interviewees specifically mentioned family considerations in the context of business and career decision making, with many permit holders (and crew) tracing multiple generations of fishing heritage, family may play

roles that are more influential than is readily recognized by male fishermen who are often conscious of their reputations for self-reliance.

Commercial Groundfishing Activity

Boat-year regressions included an independent dummy variable for activity or non-activity in commercial groundfishing during the years of survey interest. (The vast majority of boats did have commercial groundfishing activity in each year of interest. Non-groundfish-active boats used in the analysis were active in some other commercial or recreational fishery. Boats that did no fishing at all in a given year were excluded from the analysis.) Interestingly, the commercial groundfishing variable did not significantly influence the seven dependent variables for which regressions were run, those being year, number of ports reported per year, permanent Portland residence, aggregate landings and sales ports score, grounds fished, and boat length. In most cases it produced beta weights of only .1 or .2. It may be that the number of non-commercial-groundfishing was sufficiently small, and sufficiently varied in its non-commercial-groundfishing activities, that it could not produce a significant influence on the dependent variables. On the other hand, with respect to the dependent variables, in a given year the non-commercial-groundfishing boats that were worked on or owned by 2003 groundfish permit holders might not be substantially different from boats that are actively commercial groundfishing.³¹

Conclusion

Findings indicate that Portland home-ported groundfishing firms have very place-based histories. Even firms traveling away from Portland for some activities maintain established operations in Portland and Maine. It is possible that this pattern is attenuating slightly with some shifts away from Portland. Any such trend is not sufficiently pronounced to make definitive statements based on the present analyses, however. It would appear that crew have more diversified histories with respect to place-based decision making.

³¹ It should be noted that for some of these variables, such as sale ports and fishing grounds, boats not engaged in some kind of commercial fishing would have reported no data and therefore be excluded from the regression calculations.

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Appendix: Statistical Tables (Portland)

Figure 1

Portland permit holders -- univariate statistics from integer scale data

	<u>Valid</u>		<u>Confid.</u>		<u>Median</u>	<u>Min</u>	<u>Max</u>	<u>Range</u>	<u>Std.Dev.</u>	<u>Skew</u>	<u>Kurtosis</u>
	<u>N</u>	<u>Mean</u>	<u>-95%</u>	<u>+95%</u>							
yr born	20	56.0	51.6	60.4	53.5	39	76	37	9.3	0.5	0.2
age first fished	20	12.9	9.8	15.9	11.5	4	29	25	6.6	0.6	0.1
age first own boat ³²	19	24.1	19.7	28.4	26	9	41	32	9.0	0.1	-0.7
fishing generation ³³	20	2.0	1.4	2.6	2	0	4	4	1.2	0.4	-1.0
# sp permits	20	7.0	5.7	8.2	7	2	11	9	2.7	-0.2	-1.0
# sp overall	20	2.7	2.2	3.1	2.5	1	4	3	1.0	0.1	-1.0
# ports ³⁴	20	3.1	2.4	3.8	3	1	7	6	1.6	0.7	0.3
# states, countries ³⁵	20	2.1	1.7	2.4	2	1	4	3	0.8	0.5	0.2

³² Some respondents interpreted this question to ask about ownership of a commercially viable fishing boat, while others interpreted it to ask about a boat of any size/purpose.

³³ Generation includes maternal or fraternal antecedents who commercially fished, and excludes family members in fishing dependent shoreside businesses, recreational fishing, or other maritime occupations.

³⁴ Number of ports includes harbors used by the individual in the survey years, and harbor where the interviewee learned to fish, and excludes harbors where other family members fished.

³⁵ Indicates number of states or countries in which above-named ports are located.

Figure 2

Portland permit holders -- integer scale correlations -- Pearson *r*s

	yr born	age first fished	age first own boat	generation	# sp permits	# sp overall	# ports	# states, countries
yr born	1.000 N=20 p= --							
age first fished	-0.011 N=20 p=.963	1.000 N=20 p= --						
age first own boat	-0.244 N=19 p=.315	0.528 N=19 p=.020	1.000 N=19 p= --					
generation	0.312 N=20 p=.180	-0.301 N=20 p=.197	-0.174 N=19 p=.477	1.000 N=20 p= --				
# sp permits	-0.247 N=20 p=.293	0.184 N=20 p=.439	-0.061 N=19 p=.805	0.334 N=20 p=.150	1.000 N=20 p= --			
# sp overall	-0.006 N=20 p=.981	-0.797 N=20 p=.000	-0.677 N=19 p=.001	0.088 N=20 p=.713	-0.046 N=20 p=.847	1.000 N=20 p= --		
# ports	0.153 N=20 p=.519	-0.054 N=20 p=.822	-0.202 N=19 p=.408	-0.027 N=20 p=.909	0.257 N=20 p=.274	0.259 N=20 p=.271	1.000 N=20 p= --	
# states, countries	0.069 N=20 p=.774	0.156 N=20 p=.513	0.153 N=19 p=.532	0.105 N=20 p=.659	0.586 N=20 p=.007	0.023 N=20 p=.925	0.679 N=20 p=.001	1.000 N=20 p= --

Figure 3

Portland permit holders -- factor analyses

Each factor analysis allowed up to four factors, cutting off factor extraction at a minimum Eigenvalue of one and with bolded loadings >.7000. Each extraction is without rotation.

Extraction by communalities

	Factor 1	Factor 2
yr bom	0.2023	0.0229
age first fish	-0.8236	0.2052
age own boat	-0.7806	0.0419
generation	0.3043	0.2073
# sp permits	-0.0176	0.7399
# sp overall	0.8764	-0.0225
# ports	0.2705	0.6350
# states, countries	-0.0057	0.8966
Explained Var	2.2629	1.8424
Proportion Total	0.2829	0.2303
Eigenvalue	2.2629	1.8424
% Total Variance	28.2867	23.0305
Cumulative Eigenvalue	2.2629	4.1054
Cumulative % Variance	28.2867	51.3172

Extraction by principal factors (minres iterated communalities)

	Factor 1	Factor 2
yr bom	0.1360	0.0286
age first fish	-0.8153	0.2039
age own boat	-0.7089	0.0556
generation	0.2307	0.1299
# sp permits	-0.0107	0.5681
# sp overall	0.9303	-0.0171
# ports	0.2655	0.6142
# states, countries	0.0109	0.9949
Explained Var	2.1751	1.7525
Proportion Total	0.2719	0.2191
Eigenvalue	2.1751	1.7525
% Total Variance	27.1890	21.9062
Cumulative Eigenvalue	2.1751	3.9276
Cumulative % Variance	27.1890	49.0952

Extraction by maximum likelihood

	Factor 1	Factor 2
yr born	-0.0670	0.0049
age first fish	-0.1467	-0.8116
age own boat	-0.1399	-0.6894
generation	-0.1061	0.1027
# sp permits	-0.5865	-0.0649
# sp overall	-0.0353	0.9864
# ports	-0.6847	0.2396
# states, countries	-0.9941	-0.0128
Explained Var	1.8591	2.1793
Proportion Total	0.2324	0.2724
Eigenvalue	1.8591	2.1793
% Total Variance	23.2383	27.2415
Cumulative Eigenvalue	1.8591	4.0384
Cumulative % Variance	23.2383	50.4799

Extraction by centroid (principal factors)

	Factor 1	Factor 2	Factor 3
yr born	0.2665	0.3247	0.6428
age first fish	0.5590	-0.5958	-0.1028
age own boat	0.3338	-0.6120	-0.0713
generation	0.3225	0.5241	0.5735
# sp permits	0.4163	0.2274	-0.2710
# sp overall	-0.6012	0.7854	-0.1741
# ports	0.3104	0.4905	-0.3834
# states, countries	0.7604	0.4266	-0.5618
Explained Var	1.8084	2.2008	1.3242
Proportion Total	0.2260	0.2751	0.1655
Eigenvalue	1.8084	2.2008	1.3242
% Total Variance	22.6044	27.5097	16.5519
Cumulative Eigenvalue	1.8084	4.0091	5.3333
Cumulative % Variance	22.6044	50.1141	66.6660

Extraction by principal axis

	Factor 1	Factor 2
yr bom	-0.1350	0.0359
age first fish	0.8271	0.1594
age own boat	0.7134	0.0198
generation	-0.2248	0.1405
# sp permits	0.0397	0.5617
# sp overall	-0.9231	0.0317
# ports	-0.2329	0.6214
# states, countries	0.0415	1.0135
Explained Var	2.1716	1.7766
Proportion Total	0.2714	0.2221
Eigenvalue	2.1716	1.7766
% Total Variance	27.1446	22.2074
Cumulative Eigenvalue	2.1716	3.9482
Cumulative % Variance	27.1446	49.3521

Figure 4

Portland permit holders – regressions -- Non-stepwise, with pairwise deletion of missing data

Dependent variable: # ports

R= .79188494 R²= .62708176 Adjusted R²= .38977015
 F(7,11)=2.6424 p<.07264 Std.Error of estimate: 1.2408

	BETA	St. Err. BETA	B	St. Err. of B	t(12)	p-level	Valid N
yr bom	-0.1106	0.2924	-0.0189	0.0499	-0.3784	0.7123	20
age first fish	0.0713	0.3897	0.0171	0.0934	0.1830	0.8581	20
age first boat	-0.4679	0.3365	-0.0828	0.0595	-1.3907	0.1918	19
generation	-0.0262	0.2864	-0.0342	0.3742	-0.0914	0.9288	20
# sp permits	-0.3735	0.3729	-0.2175	0.2172	-1.0016	0.3381	20
# sp overall	-0.0386	0.4130	-0.0620	0.6630	-0.0935	0.9272	20
# states, countries	0.9699	0.3036	1.8633	0.5833	3.1944	0.0085	20

Analysis of Variance

	Sums of Squares	df	Mean Squares	F	p-level
Regress.	28.4758	7.0000	4.0680	2.6424	0.0726
Residual	16.9342	11.0000	1.5395		
Total	45.4100				

Dependent variable: # states, countries

R= .89956561 R²= .80921829 Adjusted R²= .68781175
 F(7,11)=6.6654 p<.00300 Std.Error of estimate: .46192

	BETA	St. Err. BETA	B	St. Err. of B	t(12)	p-level	Valid N
yr born	0.3368	0.1844	0.0299	0.0164	1.8266	0.0950	20
age first fish	-0.0526	0.2787	-0.0066	0.0348	-0.1886	0.8538	20
age first boat	0.5664	0.1973	0.0522	0.0182	2.8707	0.0152	19
generation	-0.1451	0.2002	-0.0987	0.1361	-0.7247	0.4838	20
# sp permits	0.6475	0.1988	0.1963	0.0603	3.2572	0.0076	20
# sp overall	0.2801	0.2832	0.2340	0.2366	0.9890	0.3439	20
# ports	0.4962	0.1553	0.2583	0.0808	3.1944	0.0085	20

Analysis of Variance

	Sums of Squares	df	Mean Squares	F	p-level
Regress.	9.9554	7.0000	1.4222	6.6654	0.0030
Residual	2.3471	11.0000	0.2134		
Total	12.3025				

Dependent variable: # species fished

R= .89522869 R²= .80143440 Adjusted R²= .67507448
 F(7,11)=6.3425 p<.00367 Std.Error of estimate: .56401

	BETA	St. Err. BETA	B	St. Err. of B	t(12)	p-level	Valid N
yr born	-0.1267	0.2113	-0.0135	0.0224	-0.5995	0.5610	20
age first fish	-0.6232	0.2141	-0.0930	0.0320	-2.9115	0.0142	20
age first boat	-0.4571	0.2278	-0.0504	0.0251	-2.0066	0.0700	19
generation	-0.1337	0.2051	-0.1088	0.1670	-0.6517	0.5280	20
# sp permits	-0.1117	0.2822	-0.0405	0.1024	-0.3956	0.6999	20
# ports	-0.0206	0.2199	-0.0128	0.1370	-0.0935	0.9272	20
# states, countries	0.2915	0.2948	0.3489	0.3528	0.9890	0.3439	20

Analysis of Variance

	Sums of Squares	df	Mean Squares	F	p-level
Regress.	14.1233	7.0000	2.0176	6.3425	0.0037
Residual	3.4992	11.0000	0.3181		
Total	17.6225				

Dependent variable: # species permits

R= .88122800 R²= .77656278 Adjusted R²= .63437546
 F(7,11)=5.4615 p<.00659 Std.Error of estimate: 1.6492

	<u>BETA</u>	<u>St. Err.</u> <u>BETA</u>	<u>B</u>	<u>St. Err.</u> <u>of B</u>	<u>t(12)</u>	<u>p-level</u>	<u>Valid</u> <u>N</u>
yr bom	-0.5360	0.1605	-0.1570	0.0470	-3.3391	0.0066	20
age first fish	0.3764	0.2800	0.1549	0.1152	1.3442	0.2060	20
age first boat	-0.5593	0.2265	-0.1699	0.0688	-2.4688	0.0312	19
generation	0.4432	0.1770	0.9944	0.3971	2.5046	0.0293	20
# sp overall	-0.1256	0.3176	-0.3463	0.8754	-0.3956	0.6999	20
# ports	-0.2238	0.2234	-0.3843	0.3837	-1.0016	0.3381	20
# states, countries	0.7583	0.2328	2.5017	0.7680	3.2572	0.0076	20

Analysis of Variance

	<u>Sums of</u> <u>Squares</u>	<u>df</u>	<u>Mean</u> <u>Squares</u>	<u>F</u>	<u>p-level</u>
Regress.	103.9837	7.0000	14.8548	5.4615	0.0066
Residual	29.9188	11.0000	2.7199		
Total	133.9025				

Figure 5

Portland boat-years -- univariate statistics from integer scale data

	<u>Valid</u> <u>N</u>	<u>Mean</u>	<u>Conf.</u> <u>-95%</u>	<u>Conf.</u> <u>+95%</u>	<u>Median</u>	<u>Min</u>	<u>Max</u>	<u>Range</u>	<u>Std.Dev.</u>	<u>Skew</u>	<u>Kurtosis</u>
year ³⁶	105	13.70	12.31	15.10	14	1	21	20	7.19	0.70	-0.62
# boats reported ³⁷	105	1.69	1.52	1.85	1	1	4	3	0.87	0.08	1.02
# boats owned ³⁸	98	1.11	0.93	1.30	1	0	3	3	0.93	0.09	0.56
boat length	100	65.02	60.36	69.68	70	12	120	108	23.50	2.35	-0.07
crew max ³⁹	90	3.29	2.90	3.68	3	0	10	10	1.84	0.19	1.37
longest trips ⁴⁰	88	5.64	4.90	6.37	6	1	16	15	3.47	0.37	0.33
closest to shore ⁴¹	87	24.26	15.70	32.83	3	0	180	180	40.20	4.31	2.33
farthest from shore ⁴²	86	116.29	100.10	132.48	100	0	300	300	75.51	8.14	0.17
# species per yr/boat ⁴³	96	1.76	1.56	1.97	2	1	6	5	1.01	0.10	1.99
# ports per yr ⁴⁴	100	1.48	1.37	1.59	1	1	3	2	0.56	0.06	0.61

³⁶ Year for which data pertains (coded as 1983 = 1, 1993 = 10, 1997 = 14, 2003 = 20, 2004 = 21)

³⁷ Number of boats with which interviewed permit holder was directly involved in fishing activities, including boats owned, crewed, or managed (but not boats interviewee was involved with for purposes of shoreside maintenance alone).

³⁸ Number of boats reported as owned, or part owned, by the interviewee during that year.

³⁹ Based on reports of total crew numbers per trip, using highest number given.

⁴⁰ Based on survey reports of range of trip lengths, measured in days.

⁴¹ Based on survey reports of fishing activity closest to shore, measured in miles.

⁴² Based on survey reports of fishing activity farthest from shore, measured in miles.

⁴³ Number of species reported harvested by that boat.

⁴⁴ Number of harbors reported that year by that boat.

Figure 6

Portland boat-years – ordinal scale correlations – gammas
 (Missing data pairwise deleted, all bolded gammas have $p < .05$)

	year	boats report	boats owned	perm res	temp res	boat length	crew max	prim any tie up	seco nd any tie up	prim any land	seco nd any land	prim any sale	seco nd any sale	long est trips	close shore	far from shore	fish ground	species per yr	ports per yr	
year	1.00																			
# boats reported	0.03	1.00																		
# boats owned	0.34	0.42	1.00																	
permanent residence*	0.18	0.00	0.41	1.00																
temporary residence**	0.18	0.00	0.41	1.00	1.00															
boat length	0.05	0.23	0.17	0.20	0.20	1.00														
crew # max	-0.05	0.41	0.12	-0.05	-0.05	0.69	1.00													
primary tie up	-0.41	-0.22	-0.09	0.70	0.70	0.09	-0.11	1.00												
Second tie up	-0.28	-0.10	-0.13	0.28	0.28	0.12	-0.06	0.72	1.00											
primary landing	-0.40	-0.13	-0.12	0.86	0.86	0.18	0.01	0.96	0.65	1.00										
second landing	-0.24	0.10	0.15	0.59	0.59	0.29	0.25	0.74	0.85	0.78	1.00									
primary sale	-0.48	-0.15	-0.18	0.75	0.75	0.20	0.06	0.98	0.69	0.76	0.76	1.00								
secondary sale	-0.22	-0.01	0.05	0.54	0.54	0.37	0.35	0.70	0.79	0.74	0.97	1.00								
longest trips	0.01	0.40	0.11	0.11	0.11	0.69	0.76	-0.12	0.05	0.01	0.26	0.01	1.00							
closest shore	0.06	0.41	-0.04	0.08	0.08	0.35	0.44	0.01	-0.16	-0.01	0.01	0.07	0.09	1.00						
farthest shore	0.10	0.42	0.40	0.21	0.21	0.55	0.65	-0.11	0.00	0.07	0.17	0.06	0.24	0.62	1.00					
fishing grounds	0.27	0.06	0.17	0.32	0.32	0.71	0.77	0.04	-0.09	0.31	0.18	0.29	0.28	0.75	0.36	1.00				
species	0.12	-0.21	0.18	0.32	0.32	-0.21	-0.24	0.02	-0.05	0.04	-0.23	-0.02	-0.29	-0.30	-0.29	0.86	1.00			
# ports	-0.33	-0.24	-0.04	-0.26	-0.26	0.24	0.38	0.04	0.45	-0.05	0.46	-0.03	0.56	0.19	-0.01	0.19	0.06	1.00		

Figure 7

Portland boat-years -- factor analyses

Each factor analysis allowed up to four factors, cutting off factor extraction at a minimum Eigenvalue of one and with bolded loadings >.7000. Each extraction is without rotation.

Extraction by communalities

	Factor 1
year	0.008
# boats reported	-0.395
# boats owned	-0.326
boat length	-0.823
crew max	-0.792
longest trips	-0.861
closest to shore	-0.450
farthest from shore	-0.773
# sp fished per yr	0.362
# bus ports/yr	-0.195
Explained Var	3.277
Proportion Total	0.328
Eigenvalue	3.277
% Total Variance	32.772
Cumulative Eigenvalue	3.277
Cumulative % Variance	32.772

Extraction by principle factors (minres - iterated communalities)

	Factor 1
year	0.008
# boats reported	-0.375
# boats owned	-0.295
boat length	-0.824
crew max	-0.796
longest trips	-0.872
closest to shore	-0.439
farthest from shore	-0.775
# sp fished per yr	0.353
# bus ports/yr	-0.182
Explained Var	3.253
Proportion Total	0.325
Eigenvalue	3.253
% Total Variance	32.526
Cumulative Eigenvalue	3.253
Cumulative % Variance	32.526

Extraction by maximum likelihood

	Factor 1
year	0.008
# boats reported	-0.338
# boats owned	-0.241
boat length	-0.862
crew max	-0.759
longest trips	-0.897
closest to shore	-0.471
farthest from shore	-0.745
# sp fished per yr	0.356
# bus ports/yr	-0.174
Explained Var	3.230
Proportion Total	0.323
Eigenvalue	3.230
% Total Variance	32.302
Cumulative Eigenvalue	3.230
Cumulative % Variance	32.302

Extraction by centroid

	Factor 1	Factor 2	Factor 3
year	-0.045	-0.271	0.076
# boats reported	0.450	-0.378	0.135
# boats owned	0.346	-0.757	-0.145
boat length	0.791	0.188	0.263
crew max	0.806	-0.056	-0.079
longest trips	0.816	0.137	0.310
closest to shore	0.454	0.253	0.215
farthest from shore	0.748	-0.200	0.089
# sp fished per yr	-0.352	-0.166	-0.151
# bus ports/yr	0.380	0.377	-0.864
Explained Var	3.299	1.120	1.039
Proportion Total	0.330	0.112	0.104
Eigenvalue	3.299	1.120	1.039
% Total Variance	32.995	11.202	10.393
Cumulative Eigenvalue	3.299	4.420	5.459
Cumulative % Variance	32.995	44.197	54.590

Figure 8

Portland boat-years – integer regressions -- Non-stepwise, with pairwise deletion of missing data

Dependent variable: # ports per year

R= .55915200 R²= .31265096 Adjusted R²= .14081370
 F(10,40)=1.8195 p<.08835 Std.Error of estimate: .49729

	<u>BETA</u>	<u>St. Err. of BETA</u>	<u>B</u>	<u>St. Err. of B</u>	<u>t(40)</u>	<u>p-level</u>	<u>Valid N</u>
year	-0.253	0.143	-0.017	0.010	-1.762	0.086	61
# boats reported	-0.283	0.152	-0.161	0.086	-1.863	0.070	61
# boats owned	-0.032	0.170	-0.018	0.097	-0.190	0.850	58
boat length	0.163	0.238	0.004	0.005	0.686	0.497	60
crew max	0.464	0.204	0.118	0.052	2.270	0.029	58
longest trips	-0.307	0.255	-0.047	0.039	-1.208	0.234	56
closest to shore	-0.209	0.153	-0.002	0.002	-1.359	0.182	56
farthest from shore	0.042	0.209	0.000	0.001	0.201	0.842	56
# sp fished per yr	-0.215	0.146	-0.105	0.071	-1.476	0.148	61
commercial groundfishing	0.084	0.167	0.125	0.251	0.500	0.620	61

Analysis of Variance

	<u>Sums of Squares</u>	<u>df</u>	<u>Mean Squares</u>	<u>F</u>	<u>p-level</u>
Regress.	4.499	10.000	0.450	1.819	0.088
Residual	9.892	40.000	0.247		
Total	14.391				

Dependent variable: # species fished per year

R= .48005817 R²= .23045584 Adjusted R²= .03806980
 F(10,40)=1.1979 p<.32141 Std.Error of estimate: 1.0737

	<u>BETA</u>	<u>St. Err.</u> <u>of BETA</u>	<u>B</u>	<u>St. Err.</u> <u>of B</u>	<u>t(40)</u>	<u>p-level</u>	<u>Valid</u> <u>N</u>
year	-0.176	0.155	-0.025	0.022	-1.133	0.264	61
# boats reported	-0.182	0.165	-0.211	0.192	-1.099	0.278	61
# boats owned	0.159	0.178	0.185	0.207	0.896	0.376	58
boat length	0.023	0.253	0.001	0.012	0.091	0.928	60
crew max	0.068	0.230	0.035	0.119	0.297	0.768	58
longest trips	-0.214	0.272	-0.066	0.084	-0.786	0.436	56
closest to shore	-0.178	0.164	-0.004	0.004	-1.087	0.283	56
farthest from shore	0.018	0.221	0.000	0.003	0.082	0.935	56
# ports/yr	-0.240	0.163	-0.491	0.332	-1.476	0.148	61
commercial groundfishing	-0.132	0.176	-0.404	0.539	-0.749	0.459	61

Analysis of Variance

	<u>Sums of</u> <u>Squares</u>	<u>df</u>	<u>Mean</u> <u>Squares</u>	<u>F</u>	<u>p-level</u>
Regress.	13.810	10.000	1.381	1.198	0.321
Residual	46.113	40.000	1.153		
Total	59.923				

Figure 9

Portland boat-years – regressions with dummy variables -- Non-stepwise, with pairwise deletion of missing data

Dependent variable: year

R= .79055128 R²= .62497133 Adjusted R²= .33030594
 F(22,28)=2.1210 p<.03075 Std.Error of estimate: 6.3518

	<u>BETA</u>	<u>St. Err.</u> BETA	<u>B</u>	<u>St. Err.</u> of B	<u>t(28)</u>	<u>p-level</u>	<u>Valid</u> N
boats reported	-0.292	0.517	-2.397	4.248	-0.564	0.577	61
boats owned	0.624	0.395	5.134	3.251	1.579	0.125	58
perm res ptld	0.150	0.686	2.798	12.792	0.219	0.828	60
perm res so/midcoast me	-0.284	0.436	-5.455	8.381	-0.651	0.520	60
perm res me	0.540	0.302	13.823	7.729	1.788	0.085	60
boat length	0.101	0.520	0.033	0.169	0.194	0.847	60
crew max	-0.335	0.238	-1.345	0.953	-1.410	0.169	58
prime tie ptld	0.248	0.932	4.062	15.260	0.266	0.792	61
prime tie so/midcoast me	-0.205	0.456	-4.262	9.468	-0.450	0.656	61
prime tie new england	0.298	0.367	9.258	11.388	0.813	0.423	61
second tie ptld	0.673	0.815	10.375	12.574	0.825	0.416	61
second tie so/midcoast me	-0.534	0.346	-9.337	6.038	-1.546	0.133	61
aggregate tie score	0.949	1.753	2.836	5.239	0.541	0.593	61
aggregate land sale	-0.590	0.450	-0.879	0.670	-1.311	0.200	60
longest trips	-0.187	0.842	-0.412	1.853	-0.222	0.826	56
closest to shore	-0.133	0.175	-0.023	0.030	-0.756	0.456	56
farthest from shore	-0.224	0.723	-0.023	0.073	-0.310	0.758	56
fishing grounds	0.580	0.617	7.176	7.640	0.939	0.356	55
# species caught	-0.221	0.230	-1.564	1.628	-0.961	0.345	61
# ports	-0.245	0.205	-3.540	2.965	-1.194	0.243	61
ne comm gfshg	0.119	0.230	2.370	4.606	0.515	0.611	61
casco islands	0.128	0.450	3.976	13.967	0.285	0.778	61

Dependent variable: # ports per year

R= .83460549 R²= .69656632 Adjusted R²= **.45815414**
 F(22,28)=2.9217 p<.00408 Std.Error of estimate: .39491

	<u>BETA</u>	<u>St. Err.</u> <u>BETA</u>	<u>B</u>	<u>St. Err.</u> <u>of B</u>	<u>t(28)</u>	<u>p-level</u>	<u>Valid</u> <u>N</u>
yr	-0.198	0.166	-0.014	0.011	-1.194	0.243	61
boats reported	-1.227	0.406	-0.697	0.231	-3.023	0.005	61
boats owned	0.537	0.357	0.306	0.203	1.507	0.143	58
perm res ptld	1.266	0.569	1.632	0.734	2.224	0.034	60
perm res so/midcoast me	-0.753	0.369	-1.000	0.490	-2.042	0.051	60
perm res me	0.523	0.269	0.926	0.476	1.944	0.062	60
boat length	-0.127	0.467	-0.003	0.010	-0.273	0.787	60
crew max	-0.046	0.221	-0.013	0.061	-0.210	0.835	58
prime tie ptld	-2.116	0.738	-2.395	0.835	-2.867	0.008	61
prime tie so/midcoast me	-1.246	0.338	-1.788	0.485	-3.688	0.001	61
prime tie new england	-0.840	0.294	-1.802	0.630	-2.859	0.008	61
second tie ptld	-2.190	0.616	-2.335	0.657	-3.555	0.001	61
second tie so/midcoast me	-0.791	0.287	-0.955	0.347	-2.751	0.010	61
aggregate tie score	-5.021	1.269	-1.037	0.262	-3.956	0.000	61
aggregate land sale	-0.174	0.416	-0.018	0.043	-0.419	0.679	60
longest trips	0.903	0.739	0.137	0.112	1.222	0.232	56
closest to shore	-0.266	0.151	-0.003	0.002	-1.760	0.089	56
farthest from shore	1.818	0.553	0.013	0.004	3.286	0.003	56
fishing grounds	-1.543	0.483	-1.321	0.413	-3.198	0.003	55
# species caught	0.166	0.208	0.081	0.102	0.800	0.431	61
ne comm gshg	-0.178	0.205	-0.246	0.284	-0.868	0.393	61
casco islands	-0.994	0.359	-2.134	0.771	-2.769	0.010	61

Dependent variable: aggregate landing sales score

R= .96837985 R²= .93775953 Adjusted R²= .88885630
 F(22,28)=19.176 p<.00000 Std.Error of estimate: 1.7389

	BETA	St. Err. BETA	B	St. Err. of B	t(28)	p-level	Valid N
yr	-0.098	0.075	-0.066	0.050	-1.311	0.200	61
boats reported	-0.541	0.185	-2.987	1.024	-2.916	0.007	61
boats owned	0.397	0.150	2.194	0.831	2.640	0.013	58
perm res ptld	0.628	0.253	7.871	3.174	2.480	0.019	60
perm res so/midcoast me	-0.373	0.165	-4.818	2.125	-2.267	0.031	60
perm res me	0.062	0.129	1.069	2.224	0.481	0.635	60
boat length	-0.581	0.181	-0.127	0.040	-3.207	0.003	60
crew max	-0.040	0.100	-0.108	0.269	-0.400	0.692	58
prime tie ptld	-0.867	0.343	-9.540	3.774	-2.528	0.017	61
prime tie so/midcoast me	-0.175	0.184	-2.437	2.560	-0.952	0.349	61
prime tie new england	-0.008	0.151	-0.161	3.154	-0.051	0.960	61
second tie ptld	0.074	0.336	0.770	3.481	0.221	0.826	61
second tie so/midcoast me	-0.362	0.130	-4.254	1.523	-2.793	0.009	61
aggregate tie score	-0.134	0.717	-0.270	1.441	-0.187	0.853	61
longest trips	0.946	0.293	1.400	0.433	3.230	0.003	56
closest to shore	-0.066	0.071	-0.008	0.008	-0.935	0.358	56
farthest from shore	0.610	0.272	0.041	0.018	2.245	0.033	56
fishing grounds	-0.346	0.247	-2.876	2.054	-1.401	0.172	55
# species caught	0.150	0.091	0.716	0.432	1.657	0.109	61
# ports	-0.036	0.085	-0.347	0.830	-0.419	0.679	61
ne comm gfshg	-0.236	0.083	-3.166	1.117	-2.836	0.008	61
casco islands	-0.252	0.177	-5.265	3.698	-1.424	0.166	61

Dependent variable: permanent residence Portland

R= .98568043 R²= .97156592 Adjusted R²= **.94922485**
 F(22,28)=43.488 p<.00000 Std.Error of estimate: .09376

	<u>BETA</u>	<u>St. Err.</u> <u>BETA</u>	<u>B</u>	<u>St. Err.</u> <u>of B</u>	<u>t(28)</u>	<u>p-level</u>	<u>Valid</u> <u>N</u>
yr	0.011	0.052	0.001	0.003	0.219	0.828	61
boats reported	0.703	0.053	0.310	0.024	13.168	0.000	61
boats owned	-0.527	0.054	-0.233	0.024	-9.694	0.000	58
perm res so/midcoast me	0.579	0.052	0.596	0.053	11.186	0.000	60
perm res me	-0.195	0.080	-0.267	0.109	-2.445	0.021	60
boat length	0.611	0.085	0.011	0.001	7.222	0.000	60
crew max	0.159	0.061	0.034	0.013	2.617	0.014	58
prime tie ptld	1.159	0.134	1.017	0.118	8.619	0.000	61
prime tie so/midcoast me	0.251	0.117	0.280	0.130	2.152	0.040	61
prime tie new england	0.280	0.087	0.466	0.146	3.200	0.003	61
second tie ptld	0.595	0.197	0.492	0.163	3.016	0.005	61
second tie so/midcoast me	0.237	0.088	0.222	0.083	2.673	0.012	61
aggregate tie score	1.542	0.388	0.247	0.062	3.974	0.000	61
aggregate land sale	0.287	0.116	0.023	0.009	2.480	0.019	60
longest trips	-1.111	0.099	-0.131	0.012	-11.246	0.000	56
closest to shore	0.123	0.043	0.001	0.000	2.884	0.007	56
farthest from shore	-0.886	0.108	-0.005	0.001	-8.187	0.000	56
fishing grounds	0.688	0.113	0.457	0.075	6.066	0.000	55
# species caught	-0.260	0.041	-0.099	0.016	-6.300	0.000	61
# ports	0.119	0.053	0.092	0.041	2.224	0.034	61
ne comm gfshg	0.157	0.056	0.168	0.060	2.788	0.009	61
casco islands	0.549	0.068	0.914	0.113	8.083	0.000	61

Dependent variable: boat length

R= .97490848 R²= .95044655 Adjusted R²= .91151169
 F(22,28)=24.411 p<.00000 Std.Error of estimate: 7.1147

	<u>BETA</u>	<u>St. Err.</u> <u>BETA</u>	<u>B</u>	<u>St. Err.</u> <u>of B</u>	<u>t(28)</u>	<u>p-level</u>	<u>Valid</u> <u>N</u>
yr	0.013	0.069	0.041	0.212	0.194	0.847	61
boats reported	-0.752	0.124	-19.054	3.152	-6.046	0.000	61
boats owned	0.582	0.102	14.762	2.580	5.722	0.000	58
perm res ptld	1.065	0.147	61.214	8.476	7.222	0.000	60
perm res so/midcoast me	-0.663	0.099	-39.265	5.865	-6.694	0.000	60
perm res me	0.175	0.111	13.839	8.756	1.581	0.125	60
crew max	-0.157	0.084	-1.941	1.043	-1.861	0.073	58
prime tie ptld	-1.132	0.263	-57.083	13.286	-4.296	0.000	61
prime tie so/midcoast me	-0.051	0.166	-3.265	10.625	-0.307	0.761	61
prime tie new england	-0.165	0.131	-15.806	12.555	-1.259	0.218	61
second tie ptld	-0.251	0.296	-11.939	14.074	-0.848	0.403	61
second tie so/midcoast me	-0.185	0.126	-9.970	6.790	-1.468	0.153	61
aggregate tie score	-0.820	0.621	-7.555	5.723	-1.320	0.197	61
aggregate land sale	-0.462	0.144	-2.121	0.661	-3.207	0.003	60
longest trips	1.452	0.136	9.845	0.924	10.656	0.000	56
closest to shore	-0.103	0.061	-0.054	0.032	-1.677	0.105	56
farthest from shore	0.921	0.197	0.285	0.061	4.663	0.000	56
fishing grounds	-0.652	0.192	-24.878	7.310	-3.403	0.002	55
# species caught	0.304	0.062	6.639	1.364	4.868	0.000	61
# ports	-0.021	0.076	-0.928	3.400	-0.273	0.787	61
ne comm gfishg	-0.194	0.076	-11.964	4.664	-2.565	0.016	61
casco islands	-0.492	0.135	-47.109	12.893	-3.654	0.001	61

Figure 10

Portland crew -- univariate statistics from integer scale data

	<u>Valid</u> <u>N</u>	<u>Mean</u>	<u>Confid.</u> <u>-95%</u>	<u>Confid.</u> <u>95%</u>	<u>Median</u>	<u>Min</u>	<u>Max</u>	<u>Range</u>	<u>Std</u> <u>Dev</u>	<u>Std.</u> <u>Error</u>	<u>Skew</u>	<u>Kurt.</u>
yr born	12	59.7	53.9	65.4	58.0	49.0	78.0	11.5	9.0	2.6	0.8	-0.1
age first fished	12	19.2	15.0	23.3	17.5	8.0	30.0	10.5	6.5	1.9	0.2	-0.6
generation	12	1.5	0.9	2.1	1.0	1.0	3.0	1.0	0.9	0.3	1.3	-0.3
# sp overall	12	2.5	1.6	3.4	2.0	1.0	5.0	2.0	1.4	0.4	0.9	-0.5
# ports	12	3.6	1.8	5.4	3.0	1.0	12.0	2.0	2.9	0.8	2.6	7.7
# states, countries	12	2.6	0.8	4.3	2.0	1.0	11.0	1.5	2.7	0.8	3.1	10.0

**Structures and Strategies of New England Groundfishing Businesses in
Gloucester, Massachusetts, in 'Fishing Year' 2003**

Sarah Robinson, JD, SJD
PhD Candidate
Department of Anthropology
Harvard University

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Abstract

Structures and strategies of groundfishing businesses in Gloucester, Massachusetts, in 2003, were investigated through a set of extensive interviews with a random sample of business owners in Gloucester. A key focus of the study was whether businesses used mobility as a strategy, i.e., whether they moved vessels, people, and product (fish) around as they conducted their fishing businesses.

The study found that, in 2003, the businesses were owned by individuals or by very small groups of family members, and that businesses' vessels were, in the vast majority of cases (93%), captained by a vessel (business) owner or by a family member of a vessel owner. In addition, the study found, among other things, that in 2003, the number of vessels owned by a business (defined as the person or group of persons owning and controlling a vessel or set of vessels) ranged from one to four, and averaged two. (The report contains an extensive methodological discussion, and notes that the sample of business owners was biased toward those with businesses holding multiple vessels.)

The study also found that most but not all (88%) of the businesses caught groundfish in 2003, but only 25% caught groundfish exclusively. Regarding mobility, the study found that somewhat under half the businesses were relatively immobile; 40% fished their vessel(s) exclusively in the inshore Gulf of Maine in 2003, and 44% operated exclusively out of a single port in 2003. Somewhat more than half, however, used various forms of mobility in fishing for and selling their fish: 60% fished their vessel(s) in more than one general area of ocean; 46% fished their vessel(s) in both inshore waters and offshore waters; and 56% used multiple ports (two to four) to tie-up vessels, land fish, and/or sell fish (some businesses sell some of their fish in ports other than those in which they land it, sending or taking it by truck to these 'selling ports').

The report contains a discussion of the regulatory context (for groundfish) in which these structures and strategies were created and employed (vessel-specific days-at-sea restrictions and reductions, area closures, and others). The study notes that 2003 was the year before the adoption of 10-year stock rebuilding plans for a large number of the New England groundfish stocks and accompanying regulations, among which were further reductions in vessel-specific days-at-sea allocations and, for the first time since the introduction of days-at-sea allocations in 1994, mechanisms for transferring days-at-sea from one vessel to another and hence for consolidating days-at-sea allocations. As this study examined structures and strategies in 2003, it provides a baseline account of Gloucester groundfishing businesses' structures and strategies the year before transferability was permitted in the New England groundfishery.

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Structures and Strategies of New England Groundfishing Businesses in Gloucester, Massachusetts, in 'Fishing Year' 2003¹

Sarah Robinson, JD, SJD²

I. Introduction

The New England fishing industry is in the midst of significant changes, and no part more so than the businesses that participate in the multispecies groundfish fishery. This is the fishery for cod, haddock, flounders, and other demersal finfish, prosecuted in the Gulf of Maine, on Georges Bank, and in parts south of Georges Bank. It is the oldest and largest fishery in New England, and it is, at present, the target of intensive regulatory efforts designed to rebuild overfished stocks and to “rationalize” the fishery.

Since 1994, the greater part of the commercial groundfish fishery has been a limited access fishery regulated by days-at-sea (DAS) effort controls (and by a suite of seasonal and year-round area closures, gear restrictions, minimum fish sizes, and other “input” measures).³ DAS allocations, which are annual, vessel-specific allocations of the number of “days-at-sea” a vessel may fish for groundfish species in a given year, have been reduced four times since 1994 (in 1996, 2002, 2004, and 2006). By 2006, the maximum allocation per vessel was 27.5% of a vessel’s 1994 baseline (which

¹ This is the report of a study undertaken as part of a cooperative social science research project funded by the Northeast Consortium entitled “Mapping Mobility: The Movement of New England Multispecies Vessels and Crew in New England and Beyond from 1994-2004” (Agreement No. 04-812). The ‘Mapping Mobility’ project involved two parallel studies of New England groundfishing businesses, one based in Gloucester, Massachusetts (the study reported on here) and the other based in Portland, Maine. All ‘Mapping Mobility’ project investigators jointly developed the original design of the ‘Mapping Mobility’ project and a survey instrument (see Part II) used in both the Gloucester and the Portland studies. However, the two studies – the Gloucester study and the Portland study -- were undertaken separately, by two different teams of investigators. The Gloucester team consisted of Robinson (a social anthropologist and lawyer) and three industry members, one, an original project investigator, Christine Sherman (co-owner of a fishing vessel and employee of a fishing industry organization), and two who joined the project mid-way, Don P. King (fishing captain, vessel owner, and fishing-related shoreside business owner) and Cheryl Briscoe (employee in a fishing-related shoreside business). The Portland team consisted of Jennifer Brewer (a geographer) and Gina LeDuc (industry member and wife of a fishing captain). In addition to the personnel on the two teams, one additional investigator, James Wilson (an economist) also assisted in early project design work. The ‘Mapping Mobility’ project and the Gloucester and Portland studies emanating from it were administered by the Massachusetts Fishermen’s Partnership (contractor with the Northeast Consortium) and its executive director (David Bergeron). This Gloucester report is authored by Robinson, who extends grateful thanks to the other Gloucester team members, to all project personnel on Mapping Mobility, and an extra special thanks to Don P. King, for his insights throughout and his comments on a draft of this report.

² PhD candidate, Department of Anthropology, Harvard University; sprobins@fas.harvard.edu .

³ The groundfish management plan, known as the northeast multispecies fishery management plan, is available, along with its amendments and framework adjustments, at www.nefmc.org.

amounts to 48.38 DAS for a significant portion of the fleet). By 2006, moreover, some vessels no longer qualified for this maximum and others had lost their DAS allocations all together; these were results of the 2004 reductions, in which some vessels qualified for DAS allocations in amounts below the then-maximum and others (about 7% of the 2001 permit holders) lost their DAS allocations.⁴ The 2004 restrictions also worked another important change; they allowed, for the first time since the introduction of DAS in 1994, the transfer of DAS from one permitted vessel to another.⁵

The 2004 and 2006 reductions in DAS were made in service of stock rebuilding plans adopted for 14 stocks in the groundfish fishery determined to be “overfished” (all together there are 12 species, in 19 stocks, in the multispecies groundfish fishery).⁶ These rebuilding plans call for 12 of the 14 overfished stocks to be fully rebuilt by 2013 (and the remaining two by 2026 and 2051, respectively). A fully rebuilt fishery is one in which each stock in the fishery yields its individual maximum sustainable yield. A major “benchmark” assessment is planned in 2008 for each of the 19 stocks, and additional new regulations (to ensure rebuilding progress) are planned for 2009. In addition, there are ongoing discussions about major changes in management approaches: from the DAS effort control program to the creation of multiple self-selecting, largely self-regulating fishery sectors, each one limited by annual “hard” Total Allowable Catches (TACs) of each of the 19 groundfish stocks.

These extensive changes are having – and will have – substantial effects on fishing businesses and the people who own, run, and work in them. Multiple federal laws and regulations require that effects on businesses – as well as the communities they constitute and to which they contribute – be assessed and considered as new regulations, and changes to existing regulations, are developed and adopted.⁷ These requirements notwithstanding, there is much about the fishing industry that has not been considered in the development and modification of regulations. In part, this is due to a lack of systematic empirical study of the industry in recent years. One area neither studied nor much considered is the structures and strategies of the fishing businesses that fish for groundfish. This is a critical lack as businesses’ structures and strategies

⁴ This was because the 2004 allocations were based on use of DAS in a six year period prior to 2004 (1996-2001), and vessels unable to demonstrate DAS use (and landings) in that period lost their DAS (technically, their DAS became “C” DAS, which are DAS not usable under the groundfish management plan). See Amendment 13 to the Northeast Fishery Management Plan, Final Rule, 69 FR 22906 (Apr. 27, 2004). The 7% figure is derived from information available in Framework 42 to the Northeast Multispecies Fishery Management Plan, Final Document (Apr. 21, 2006), table 31, p. 178; table 31 indicates that there were 1589 permitted vessels in 2001 and 1484 permitted vessels (“A” DAS permitted vessels) in 2004.

⁵ See Amendment 13 Final Rule, 69 FR 22906.

⁶ For the 2004 reduction (and related changes), see Amendment 13, Final Rule, 69 FR 22906; for the 2006 reduction, see Framework 42 Final Rule, 71 FR 62156 (Oct. 23, 2006).

⁷ These include the Magnuson-Stevens Act (the federal fishery management statute), the National Environmental Policy Act, and the Regulatory Flexibility Act, among others.

constitute, on the one hand, resources that businesses use in responding to (and, in some cases, working to shape) fishing regulations, and, on the other, characteristics of the businesses that are subject to being changed -- either diminished or intensified -- by new fishing regulations. The study reported on here was designed to address this lack; it investigated the structures and strategies of fishing businesses in New England, in particular, those fishing for groundfish and operating out of Gloucester, Massachusetts.

One question of particular interest to the study was the extent to which fishing businesses use mobility as a strategy: To what extent do fishing businesses move vessels, people, and product (fish) around as they fish, land fish, and sell fish? This question was of particular interest because, while federal law mandates that fishery managers consider the effects of regulation on “fishing communities,” federal fishery regulators have interpreted “fishing communities” to mean *geographical* communities dependent on fishing.⁸ Consequently, fishery management plans consider the effects of regulations on discrete individual “communities” that lie along the coast (the limits of the municipality, town, or county providing the geographic contours of the community). These analyses consider far less the inter-relationships among geographic places or the ways in which commercial fishing can link discrete geographic places and/ or create “fishing communities” that are both smaller and larger than towns, cities, or counties and/or that are less geographically-based than, for example, occupationally-based or practice-based. In inquiring into the mobility practices of fishing businesses in a particular geographical “community,” therefore – the port of Gloucester – the study aimed at learning both about the businesses themselves and about the “communities” created by and contributed to by the businesses.

A note is needed on the use of “fishing business” as the unit of analysis. Much fisheries research makes “vessels” or “fishermen” the unit of analysis; presumably this is because of the interest in quantifying effort in a fishery and because, relatedly, much information about fisheries is collected on a vessel by vessel basis and, though less so, on a fisherman by fisherman basis. This study focuses, instead, on fishing businesses; this is because the focus here is on (a) the people who fish (specifically, those who fish commercially), and (b) the structures they create in order to fish, i.e., their businesses. In making fishing businesses the unit of analysis, moreover, the study takes seriously the insistent admonition heard in the field: commercial fishing *is a business*. In addition, while – as the study shows – fishing businesses that fish for groundfish are small and independent (comprised of a single individual or a small group of individuals), it is wrong to assume that each fishing business owns and runs a single commercial fishing vessel; a focus on fishing businesses avoids this assumption and requires, instead, an inquiry into the number (and types) of vessels owned by individual fishing businesses. Such an inquiry (as was undertaken here) then enables the compilation of a more accurate account of the social and economic organization of commercial fishing in New England. Finally, it should be made clear that, in focusing on fishing *businesses*, the study did not intend to obscure the extent to which families and communities are integral to

⁸ For the regulatory definition, see 50 CFR 600.345.

commercial fishing in New England. Rather, the study seeks to illuminate inter-relationships among fishing businesses, fishing families, and fishing communities.

A brief introduction to the port of Gloucester is required. Gloucester prides itself on being the oldest fishing port in the nation.⁹ In the 20th century, its fishing industry members came both from within the city and environs and from places far afield: among them, the Canadian Maritimes, Portugal, Sicily, Ireland, and various locales within the United States (among them, Michigan, Washington, DC, Connecticut, Washington). In the latter half of the 20th century, its industry members seined and trawled for herring and mackerel, dragged for redfish, ventured to the Grand Banks for swordfish, caught tuna by harpoon, long line, and seine, fished with bottom trawl, gillnet, longline, and other gears for the full range of groundfish species (cod, haddock, yellowtail flounder, and other bottom dwelling species), and, in the 1990s, developed or participated in niche fisheries for sea urchins, slime eels, monkfish, red crab, and other species. Gloucester has a large and well-protected natural harbor, and it is located on Cape Ann, a rocky promontory on the Atlantic Ocean in proximity to the two major fishing grounds off the coast of New England: the Gulf of Maine and Georges Bank.

A cooperative research project in 2003 established that Gloucester was, in 2003, a regional hub port for the New England fishing industry and had been so for a very long time (Robinson et al 2003, 2005). Gloucester's shoreside businesses provide services – a fish auction, other fish buyers, gear supplies, haul-out facilities, and so on – for vessels fishing from the port of Gloucester but also for vessels fishing from ports to the north and south of Gloucester. Gloucester also provides dockage to both resident vessels (vessels for which Gloucester is homeport) and visiting vessels (vessels that fish from Gloucester for temporary periods but that are homeported elsewhere). That study also showed that, while the port had seen many changes over the years, it was, at that time, in the midst of profound changes. Some of these changes were related to the extended downturn in NE groundfish landings since the 1980s. One of these changes, and among the most profound, was a decline, since the 1980s, in the number and percent of large (70-100 feet) fishing vessels resident in the port.

The New England groundfish fishery is and has been very important to Gloucester, even as groundfish landings and revenues have declined in recent years. From 1975 to 2004, ex-vessel revenues from groundfish landings in Gloucester ranged from a high, in 1981, of \$63.7 million (in 2002 dollars) to a low, in 1997, of \$12.6 million (in 2002 dollars), and averaged \$33 million (in 2002 dollars). In 2003 and 2004, revenues from groundfish landings in Gloucester were, respectively, \$18 million and \$18.7 million (in 2003 and 2004 dollars; \$17.6 million and \$17.8 million, respectively, in 2002 dollars). These groundfish revenues were responsible, in this period (1975-2004), for very large percentages of the port's total ex-vessel revenues (revenues from landings of all species combined): from a high (in 1984) of 78% to a low (in 2000) of

⁹ The City of Gloucester's official website introduces the City with these words: "We are America's oldest fishing port. Since 1623, Gloucester has been serving the world as a harvester of quality seafood." See www.ci.gloucester.ma.us.

42%. The average for 1975-2004 was 62%, and in 2003 and 2004, the figures were, respectively, 48% and 57%.¹⁰ Notably, however, at least in recent years (1994-2001, years for which federal data are accessible), vessels landing groundfish in Gloucester have been homeported in the port of Gloucester *and* in ports outside of Gloucester. The number of vessels homeported in Gloucester and landing groundfish, as a percentage of the number of vessels landing groundfish in Gloucester, was, in 1994, 63%, and, in 2001, 57%.¹¹ The absolute number of vessels homeported in Gloucester and landing groundfish from 1994 to 2001 ranged from a low of 124 (in 1998) to a high of 165 (in 1994), and was 149 in 2001. By contrast, the number of vessels landing groundfish in Gloucester in this period (1994 to 2001) ranged from a low of 192 (in 1996) to a high of 279 (in 2000), and was 261 in 2001.¹²

II. Project Methods and Scope of the Report

This study was undertaken as part of a cooperative social science research project involving the combined efforts of social scientists and fishing industry members.¹³ The principal method employed in the study was the development of a long survey and the administration of the survey – by interviews – to a random sample of fishing business owners participating in the groundfish fishery out of Gloucester in 2003. Groundfish business owners in Gloucester were identified through federal permit databases, in the manner described below. In addition, the survey was supplemented by ethnographic fieldwork and by analyses of federal databases.

The sampling frame:

A major aim of the study was the use of random sampling techniques to identify the fishing business owners to be interviewed. The project aimed for random samples of business owners for several, inter-related reasons: (1) to eliminate or reduce bias in

¹⁰ All figures cited thus far in this paragraph are taken from (or calculated from figures in) Robinson et al 2005, and are based on data provided by NOAA Fisheries (see Robinson et al 2005:7 & table 2).

¹¹ These figures were calculated from figures in Tables 607 and 608 of the Final Supplemental Environmental Impact Statement for Amendment 13 to the Northeast Multispecies Fishery Management Plan, Vol. II., pp. II-1561-1562 (Dec. 18. 2003). Note that the numbers of vessels homeported in Gloucester and landing groundfish in Gloucester, as percentages of the total number of vessels landing groundfish in Gloucester, may be overstated in the figures in the text above: This is because the figures for the number of vessels homeported in Gloucester and landing groundfish are for *all* vessels homeported in Gloucester and landing groundfish, *anywhere they land the groundfish* (see *id.*, at p. II-1561). The figures in the text (calculated from these homeported vessels figures) *assume* that the homeported vessels landed their groundfish in their homeport – Gloucester – but this may not have been – and probably wasn't – the case for all the vessels all the time.

¹² See Tables 607 and 608 of the Final Supplemental Environmental Impact Statement for Amendment 13 to the Northeast Multispecies Fishery Management Plan, Vol. II., pp. II-1561-1562 (Dec. 18. 2003).

¹³ See note 1 above.

the selection of interviewees, (2) to maximize the likelihood that the samples would reproduce the various ranges of variation (i.e., across multiple factors) found in the populations, and (3) to enable the use, to the extent appropriate, of inferential statistical techniques (i.e., to permit statistical inferences from the samples to the populations of groundfishing businesses operating in the two ports).

The use of random sampling techniques required identification of the population of groundfish businesses to be sampled (the sampling frame). This presented a challenge, however, as there is no pre-existing list of fishing businesses operating out of Gloucester (nor is there a pre-existing list of fishing businesses operating in the New England region). What there are, however, are various sorts of lists of fishing vessels associated with individual ports (reflecting the focus, in fisheries, on vessels rather than on fishing businesses). After considering a variety of vessel lists,¹⁴ the study settled on the use of a vessel list created from publicly available federal fishing permit data.¹⁵ The list created and used was a list of all federally-permitted commercial fishing vessels in fishing year 2003¹⁶ for which (a) Gloucester was “principal port,” and (b) a multispecies (groundfish) permit had been issued. (The meaning of “principal port” is discussed below.) This Gloucester “principal port” list – a vessel list – functioned as a surrogate for the non-existent list of fishing businesses operating out of Gloucester in 2003 (and fishing for groundfish), and, as such, was used as the sampling frame from which the random sample of groundfishing businesses was drawn for interviews. There were several limitations with the use of this list as the sampling frame (these are detailed

¹⁴ One approach considered for identifying vessels was the use of an ice list – a list of fishing vessels buying ice in Gloucester in a given year. Gloucester’s sole ice company was graciously willing to make available such a list to the project. The virtue of an ice list is it identifies vessels actually operating out of a given port (see Robinson et al 2003). The use of an ice list was rejected after investigation revealed that not all vessels purchase ice when they go fishing; some smaller day vessels do not use ice, and some larger vessels use recycled sea water or other on-board means of cooling fish (while these latter methods are generally not used in fishing for groundfish, the project was interested in all vessels owned or fished by groundfish industry members, including non-groundfish vessels). The potential under-inclusion of certain vessels, both the very small and some of the relatively large, led to the decision not to use ice lists to identify the universe of vessels operating from each port.

¹⁵ Publicly available federal permit data identify all federally-permitted vessels by vessel name, permit number, hull number, vessel owner, vessel owner address and phone number, the “principal port” of the vessel as identified by the vessel owner on initial permit applications and annual permit renewals, the vessel length, the gross tonnage of the vessel, the vessel horsepower, and the fisheries in which the vessel is permitted to participate. In addition, in a separate file, information is provided about the specific categories of permits each vessel holds in each fishery in which it is permitted to participate. (In the case of multispecies (groundfish) permits, as discussed below, there were, in 2003, at the time the federal permit data was used for this study, eleven different groundfish permit categories, seven of which were limited access permits and four of which were open access permits.) The data are available through links from the homepage of the Northeast Regional Office of NOAA Fisheries, www.nero.noaa.gov. Vessel owners must renew vessel fishing permits each fishing year, providing updated information, if any, about their vessels (see 50 CFR 648.4(a)(1)); hence, federal permit data are kept up-to-date.

¹⁶ The fishing year for the groundfish fishery is not a calendar year; instead, it runs from May 1 of a given year to April 30 of the following year. See 50 CFR 648.82(b). The federal permit data used for the study was compiled on March 5, 2004, and hence was valid for the 2003 fishing year.

below), but it was determined that the list was the best available sampling frame, and that, with knowledge of its limitations, good use could be made of it.

The first limitation in using the principal port list as the sampling frame for generating a simple random sample of businesses to interview was the simple fact that the principal port list was a vessel list and not a business list. This limitation was overcome by, essentially, converting the sample of *vessels* drawn from the vessel list into a sample of *businesses*. This was done as follows: A simple random sample of vessel names was generated from the vessel names on the principal port list (using a computerized simple random sample generator). Each vessel name in the sample was then used to generate the name of a fishing business, specifically, the fishing business owning the named vessel. While this may seem self-evident, the consequences of so proceeding are less so: The owner of each fishing business thus identified (and agreeing to be interviewed, see part III for a discussion of response rates) was asked about *all* commercial fishing undertaken in the years inquired into, both on the vessel through which the business was identified (the vessel named in the sample) *and on any other vessels owned or fished by that fishing business in those same years*. In this manner, therefore, the project was able to gather information about all commercial fishing undertaken by a fishing business in a given year. For some fishing businesses, commercial fishing in a given year was limited to that undertaken with the vessel through which the business had been identified (the vessel named in the sample); for other businesses, however, commercial fishing activity in a given year involved an additional vessel or vessels beyond the one through which the business was identified.

The second limitation in using the “principal port” vessel list as the sampling frame was that doing so resulted in a sample that was biased – to an unknown degree – toward businesses that own multiple vessels. This is because businesses with more than one vessel on the principal port list were represented more than one time on the list (as many times as they had vessels on the list) and therefore had more than one opportunity to be selected when the vessels on the list were sampled (as many opportunities as they had vessels on the list). This problem could not be overcome, moreover, by sorting the principal port list by names of vessel owners, identifying and removing multiple instances of the same owner, and then sampling vessel owner names (rather than, as was done, vessel names): Fishing businesses often hold different vessels in different names (in some cases, businesses create corporate entities to hold their vessels, and businesses with multiple vessels create separate corporate entities for each vessel held), and there is no reliable way to identify multiple instances of individual owners (businesses) on the list. We addressed this limitation as follows: First, while we could not ensure that each vessel on the principal port list represented a unique owner or business (for the reason just described), we did confirm that each vessel in the *samples* drawn from the principal port list represented a separate and unique fishing business (we did so in the process of identifying, locating, contacting, and interviewing the owners of the vessels – businesses – in the samples). Second, we acknowledged the fact that, even though the samples consisted of vessels representing unique fishing businesses, the samples were nonetheless biased – to an unknown degree – toward businesses (i.e., vessel owners) that own more than one vessel.

The third limitation in using the principal port list as the sampling frame was that the list likely falls short of being a full and accurate account of each and every vessel that fished out of Gloucester in 2003 (and that had a groundfish permit). This is due to the characteristics of a “principal port” list: A vessel owner identifies the “principal port” of a vessel in permit applications (and renewals); “principal port” is defined in permit applications as the “city and state where the majority of your landings occur.”¹⁷ The list of all federally permitted vessels for which a given port is principal port in a given year, therefore, is a list of all vessels for which a vessel owner has indicated that the port is the one in which, that year, the vessel will land the majority of the fish (or shellfish) it catches. As such, a principal port list for a given year is likely to be a fairly accurate list of the vessels actually using that port that year (at least for landing fish). That said, there is potential for a principal port list for a given year to include vessels that do not use the port that year (to be *overinclusive*) and, conversely, to exclude vessels that do use the port that year (to be *underinclusive*). A principal port list will be *overinclusive* if there are vessels on the list do not in fact fish from (or land fish in) the port that year, either because (a) they are fishing from (and landing fish in) other port(s) that year instead (nothing *obliges* a vessel owner to fish from the vessel’s principal port), or (b) they are not fished at all that year. A principal port list will be *underinclusive* if it fails to include vessels that use the port that year; these would be vessels whose owners have not named the port as principal port but who nonetheless fish the vessels from (or land the vessels’ catch in) the port. Vessel owners are limited to a single “principal port,” but there is no restriction on using multiple ports in a given year (or on using a port other than a vessel’s principal port); hence, vessel owners that did not name Gloucester as their vessels’ principal port in fishing year 2003 may nonetheless have fished from Gloucester in fishing year 2003.¹⁸ The potential for the Gloucester principal port list to be both overinclusive and underinclusive could not be overcome and is simply noted.¹⁹ Despite this likely over- and under-inclusiveness, the principal port list for 2003 was the most complete list available of the vessels (and, hence, the fishing businesses) operating out of Gloucester in 2003.

Finally, the fourth and last limitation in using the principal port list as a sampling frame concerned the extent to which the list accurately identified the vessels

¹⁷ See National Marine Fisheries Service, Northeast Regional Office, Fisheries Statistics Office, *Initial Vessel Application, Instructions for Northeast Federal Fishing Vessel Permits* (OMB# 0648-0202, revised 4/10/2007, expires 11/30/2009).

¹⁸ On this point, federal data show that, in each year from 1994-2001 (years for which the data are available), nearly twice the number of vessels landed groundfish in Gloucester as were homeported in Gloucester and landing groundfish. It is probably fair to assume that some of the vessels landing groundfish in Gloucester did not identify Gloucester as principal port, i.e., some of the vessels landing groundfish in Gloucester that were not homeported in Gloucester). See discussion at the end of Part I.

¹⁹ The only way to ascertain whether vessels on the Gloucester principal port list in 2003 actually landed fish in Gloucester in 2003 would have been to compare the principal port list with a list of vessels actually landing fish in Gloucester in 2003. We did not explore whether it would be possible to obtain such a list from NOAA Fisheries; confidentiality issues, among others, could well obviate such a request.

(businesses) *participating in the groundfish fishery* in fishing year 2003. As indicated, the list identified all vessels whose owners named Gloucester as principal port in 2003 and that had a multispecies (groundfish) permit in 2003.²⁰ The list thus captured all vessels (businesses) *permitted* to participate in the groundfishery in 2003 and operating from Gloucester (noting the above “principal port” caveats above). However, some vessels permitted to fish for groundfish in 2003 did not fish for groundfish in 2003: federal data indicate that, in 2003, fishery-wide, 66% of the vessels with Days-at-Sea (DAS) limited access groundfish permits did not use their permits in 2003 (i.e., did not “call in” and, therefore, presumably did not fish for or land groundfish).²¹ Thus, there was no way to be sure (or even reason to think) that the principal port list consisted entirely of vessels (businesses) actually participating in the groundfishery in 2003. This limitation was addressed simply by recognizing that, in using the list to sample vessels (businesses), we were sampling vessels (businesses) with permits to participate in the groundfishery in 2003 that may or may not have actually participated in the groundfish fishery in 2003.

A limited access days-at-sea sample and a handgear sample:

The principal port list created for Gloucester for 2003 is described in detail in Part III below. In addition, two subsets of the principal port list are also described in detail: one, the subset of vessels on the list with *limited access days-at-sea (DAS)* groundfish permits, and the other, the subset of vessels with groundfish permits other than limited access DAS permits (90% of which were vessels with *handgear* groundfish permits). As described in Part III, it was decided, after a vessel sample was generated from the full principal port list and initial interviewing had begun, to divide the vessel sample into two sub-samples, a limited access DAS vessel sample and a handgear vessel sample, and to expand the limited access DAS vessel sample. This decision to divide the original vessel sample into two (and to expand the limited access DAS vessel sub-sample) is described in Part III. So, too, are the resulting two samples and their response rates.

Also, as indicated, Part III describes two subsets of vessels on the principal port list: (1) the subset with limited access DAS permits, and (2) the subset with groundfish permits other than limited access DAS permits: It details the number of vessels in the two subsets, the lengths of the vessels in the two subsets, and the specific types of groundfish permits on the vessels in the two subsets. Part III also contains an analysis of the limited access DAS vessels owned by the business owners in the limited access DAS sample (the full set of which could not be known until the limited access DAS vessel sample was converted to a business sample and the business owners were

²⁰ Also as indicated, the permit information was valid for *fishing year* 2003, which ran from May 1, 2003 to April 30, 2004 (see 50 CR 648.82(b), 10-1-2003 ed.); hereafter “2003” will signify *fishing year* 2003 unless otherwise indicated.

²¹ Fishery-wide, there were 1404 DAS limited access groundfish permits in fishing year 2003; of these, 931, or about 66%, were active; see Framework 42 to the Northeast Multispecies Fishery Management Plan, Final Document, 4-21-2006, p. 178 (table 31).

interviewed²²). The analysis of the limited access DAS vessels owned by the owners in the sample compares the owners' limited access DAS vessels with the full set of limited access DAS vessels on the principal port list (i.e., the limited access DAS vessel subset on the principal port list).

The survey instrument:

The study developed a survey instrument for use in interviewing the vessel owners (business owners) in the samples about their fishing businesses.²³ The survey inquired into vessel owners' business and fishing practices in three discrete years: fishing year 2003 and two prior years, 1993 and 1983. Fishing year 2003 was a critical year for two reasons: First, the vessel (business) samples had been created from the fishing year 2003 principal port list. Second, and importantly, fishing year 2003 was the year just prior to the year in which two major changes in groundfish regulation occurred (both took effect at the start of fishing year 2004): The first change was the implementation of the long anticipated regulations implementing the 10-year rebuilding plans for 11 of the 19 groundfish stocks; these included new qualifications for maintaining DAS permits and vessel-specific reductions in DAS. The second change was the implementation of regulations permitting, for the first time since the creation of the limited access fishery and DAS effort control program for the limited access fishery, the transfer of DAS from one vessel to another. By inquiring into business and fishing practices in fishing year 2003, therefore, the survey was intended to – and did – enable the characterization of the groundfishing businesses operating out of Gloucester the year *before* the major changes in groundfish regulations went into effect.

The survey also inquired into the vessel owners' business and fishing practices in 1993 and 1983, in order to learn about *their histories* of business and fishing practices. The survey results for 1993 and 1983 cannot be used to characterize the full set of groundfishing businesses operating out of Gloucester in 1993 and 1983. This is because the full set of groundfishing businesses operating out of Gloucester in these two years were not sampled; rather, the full set of groundfishing businesses operating out of Gloucester *in 2003* was sampled. However, the information about practices in 1993 and 1983 is highly useful for what it can reveal about the practice histories (the experiences and undertakings) of fishing business owners active in Gloucester in 2003. The years 1993 and 1983 were chosen for the survey both (1) because, taken together with the 2003 data, they span a long period (21 years) in the groundfishery, and (2) because of the particular significances of the two years. Thus, 1993 was the last year in which the commercial groundfish fishery (much of it) was open access: in 1994, a major part of the commercial fishery was made into a limited access fishery and the DAS effort control program for limited access vessels was adopted.²⁴ Also, 1993 was a year in

²² See the sampling frame discussion above.

²³ See note 1.

²⁴ See Amendment 5 to the Northeast Multispecies Fishery Management Plan, Final Rule, 59 FR 9872 (March 1, 1994).

which combined (domestic) groundfish landings – and stock abundance indices – were declining to a period of record lows (occurring in the middle and late 1990s).²⁵ By contrast, 1983 was a year in which (domestic) groundfish landings were close to their post-Magnuson Act high, and it was also the year *before* the International Court of Justice rendered its decision (in 1984) on the offshore boundary between the United States' and Canada's respective exclusive economic zones.²⁶

Locating, contacting, and interviewing the vessel (business) owners:

While the samples of vessel names included vessel owner names, addresses, and phone numbers (from the federal permit data included on the principal port list), in many cases, the owner names were corporate names. For vessels with corporate owners, it was necessary to identify and locate the individual(s) who were shareholders of the corporation. This was done through basic ethnographic fieldwork: by searching for the vessels themselves in port, asking known key informants for the vessels' whereabouts and the owner(s)' name(s), trying the corporate phone numbers, and web searches. In addition, fieldwork was also required to find working phone numbers for some of the individual (non-corporate) vessel owners in the samples. Finally, some vessels in the samples had been sold – sometime between the time the vessels appeared on the 2003 principal port lists from which the samples were created and the time the interviews took place – and fieldwork was required to identify and locate the vessels' 2003 owners.

The survey was administered by interviews. Approximately half of the interviews were conducted by industry interviewers (Sherman, King and Briscoe) and half by an anthropologist (Robinson), and all but three (two where owners were out of state) were conducted in person (in interviewees' or interviewer's homes, in pilot houses and in galleys, and on docks).²⁷ Interviews ran from about 45 minutes to several hours. While response rates were high (see below), it needs be noted that this was due in large part to the persistence of the interviewers and, in some cases, to the existence of pre-existing relationships between interviewer and interviewee. Many vessel owners were not at all keen in participating in "yet another" survey; to quote one vessel owner, "I get interview requests from NOAA all the time; they go in the trash. I have no interest in it. All that stuff is a waste of time."

²⁵ For landings (and relative abundance indices) for the "principal groundfish and flounder stocks off the U.S. northeast" in the period 1960 -1997, see Murawski et al 1999: 6 (figure 5); for total domestic landings of all 19 large mesh groundfish stocks regulated as part of the New England groundfish ("northeast multispecies") management plan in the period 1975-2003, see Robinson et al 2005: table 1.

²⁶ For landings figures, see Murawski et al 1999, and Robinson et al 2005; for the International Court of Justice decision, see ICJ 1984.

²⁷ Robinson conducted 69% of the limited access DAS vessel owner interviews and 14% of the handgear vessel owner interviews; Sherman, and King and Briscoe, conducted 31% of the limited access DAS vessel owner interviews, and King and Briscoe conducted 86% of the handgear vessel owner interviews.

The antipathy toward “NOAA” interviews (which lingered even after it was explained this was not a NOAA project) was fueled, for many, by grim events in the regulatory arena in 2005 and 2006: In 2005, one year after the 2004 adoption of the 10-year rebuilding plans (and accompanying new qualifications for maintaining DAS and new vessel-specific reductions in DAS), it was determined that the much worked-on 2004 restrictions were insufficient to implement the 2004 rebuilding plans. Two sets of new restrictions were developed for 2006, the first a set of “emergency” rules, the second a set of regulations issued in due course; the latter, still in effect, imposed a further DAS reduction as well as a 2:1 DAS counting rule for vessels fishing in two large areas of ocean, one in the inshore Gulf of Maine (running shoreside from Cape Cod to Southern Maine), and the other in Southern New England. Vessels fishing in the “2:1 areas” thus had a further *de facto* DAS cut of 50%. Further, the 2004 rules had included, for the first time, mechanisms for transferring DAS from one vessel (permit) to another, and many vessel (business) owners were preoccupied with changes being wrought by the buying and selling of permits and the leasing of DAS. It was (and still is) a chaotic and difficult time for many vessel (business) owners in the groundfish industry. For many, a request to participate in a research project such as this one seemed, at best, beside the point. Nonetheless, as indicated, our response rates were, in fact, very high, and when vessel owners did finally agree to interviews, they were, in the end, gracious, engaged, and forthcoming, if, nonetheless, skeptical.²⁸

The scope of the report:

This report presents and analyzes a subset of the data collected in the study. The report presents and analyzes the data from the interviews of the sample of limited access DAS vessel (business) owners, in particular, the data about the limited access DAS vessel (business) owners’ personal backgrounds, their careers in commercial fishing, their business structures and practices in 2003, and their businesses’ fishing and mobility practices in 2003. The report does not examine the data collected about the limited access DAS vessel (business) owners’ business structures and practices, and fishing and mobility practices, in 1983 and 1993. It does not, in other words, examine the information collected about the limited access DAS vessel (business) owners’ *histories*. In addition, and separately, this report does not present and analyze the data from the interviews of the sample of handgear vessel owners.

This data not yet analyzed (the 1983 and 1993 data for the limited access DAS vessel owners and the data from the handgear vessel owner interviews) is extremely valuable and will be analyzed at a later date. The decision to defer analysis of the 1983 and 1993 limited access DAS data and the handgear data was made because of the large volume of data collected by the project, and the need to prioritize analyses of this data. It was decided that the first priority for analysis would be the limited access DAS

²⁸ Following interviews, vessel owners were sent a thank you letter, which included an honorarium of \$50; the letter stated that the \$50 was “offered as a thank you,” but that the \$50 was “a token amount” and offered “only as token and not as payment.”

vessel (business) owners and their practices in 2003, the year just before the 10-year rebuilding plans and the DAS transferability provisions went into effect.

III. Results

1. The Gloucester Principal Port List

The Gloucester “principal port” list created for this study from federal fishing permit data consisted, as indicated above, of a list of the names of all federally-permitted commercial fishing vessels: (a) whose owners had identified Gloucester as the vessel’s “principal port” for fishing year 2003, and (b) that had a multispecies (groundfish) permit in 2003 (in any groundfish permit category). In this section, the vessels on this principal port list are described; provided are: (1) the number of vessels; (2) the sizes (lengths) of the vessels; (3) the vessels’ ‘home’ locations; and (4) the specific permit categories of the groundfish permits on the vessels. In addition, two subsets of the principal port list are characterized: the subset of vessels with limited access DAS permits (permit categories A, B, D, F, and G) and the subset of vessels with permits other than limited access DAS permits (permit categories H, I, J, K).

The entire principal port list:

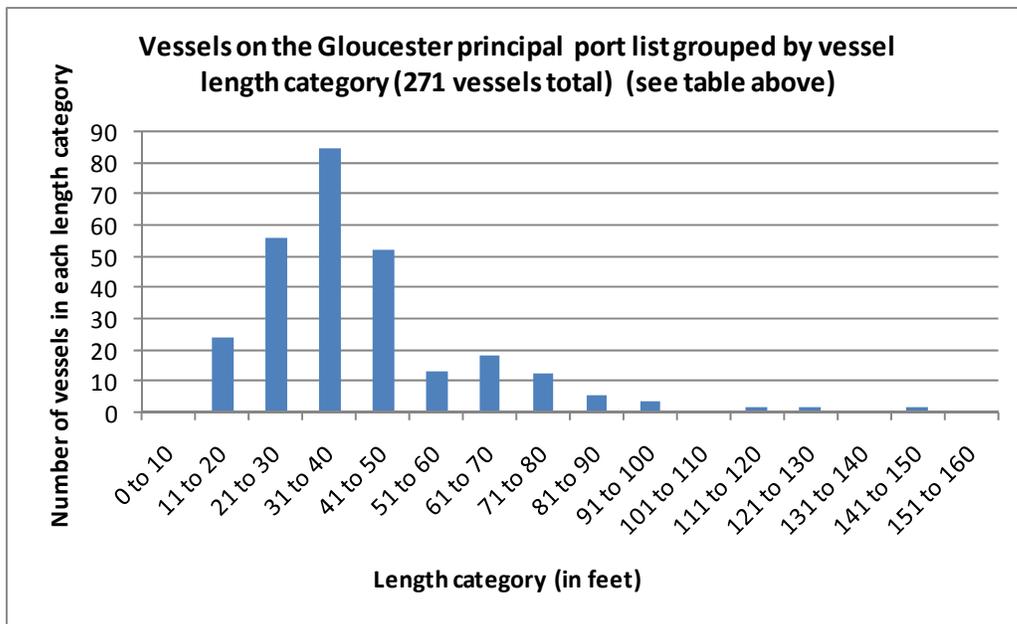
Number of vessels: In fishing year 2003, 307 vessels with federal fishing permits identified Gloucester, MA, as principal port.²⁹ Of these 307 vessels, 271 vessels, or 88%, had federal groundfish permits, in any groundfish permit category (groundfish permits are known as “northeast multispecies” permits). These 271 vessels comprise the entire Gloucester “principal port” list.

Vessel lengths: Analysis of the lengths of the vessels on the 2003 Gloucester principal port list indicates the extent to which, in 2003, Gloucester was a “small boat” port. As shown in the tables and chart below, the mean length of the 271 vessels on the principal port length was 41 feet, and the median of the vessel lengths was 38 feet. Also, 85% of the vessels (230/271) were 60 feet in length or smaller.

²⁹ The 307 vessels include *federally-permitted* vessels only. State-permitted Gloucester vessels in 2003 that did not also have federal fishing permits in 2003 are not included among the 307 vessels.

Vessel lengths for all vessels on the Gloucester 'principal port list' (all vessels with groundfish permits - any category - with Gloucester as principal port in 2003) (271 vessels total)

<i>Length category (feet)</i>	<i>Number of vessels</i>	<i>Cumulative number of vessels</i>	<i>Percent of vessels</i>	<i>Cumulative percent of vessels</i>
0 to 10	0	0	0%	0%
11 to 20	24	24	9%	9%
21 to 30	56	80	21%	30%
31 to 40	85	165	31%	61%
41 to 50	52	217	19%	80%
51 to 60	13	230	5%	85%
61 to 70	18	248	7%	92%
71 to 80	12	260	4%	96%
81 to 90	5	265	2%	98%
91 to 100	3	268	1%	99%
101 to 110	0	268	0%	99%
111 to 120	1	269	0%	99%
121 to 130	1	270	0%	100%
131 to 140	0	270	0%	100%
141 to 150	1	271	0%	100%
151 to 160	0	271	0%	100%



To complete the overall picture of the vessels in the port of Gloucester in 2003, the vessel lengths of the vessels on the Gloucester principal port list (vessels with Gloucester as principal port and with groundfish permits) may be compared with the vessel lengths of the full set of vessels with federal fishing permits and Gloucester as

principal port in 2003 (those with groundfish permits and those without groundfish permits), and with the vessel lengths of the vessels with federal fishing permits, *but no groundfish permit*, and Gloucester as principal port in 2003. As shown in the table below, the median of the vessel lengths of vessels with groundfish permits was 38 feet, the median of the vessel lengths of vessels without groundfish permits was 32 feet, and the median of all vessels (with and without groundfish permits) was 35 feet.

Comparison of vessel lengths on Gloucester principal port list in 2003 with vessel lengths of other 'Gloucester' vessels in 2003 (lengths in feet) (see text)

'Gloucester' vessel list type	mean length	median length	minimum length	maximum length	range (max - min)
Gloucester principal port list: all vessels with groundfish permits (n=271)	41	38	14	141	127
all vessels with <i>any</i> federal fishing permit and Gloucester as principal port (n=307)	40	35	12	141	129
all vessels with federal fishing permit <i>but no groundfish permit</i> and Gloucester as principal port (n=36)	31	32	12	49	37

Vessels' 'home' locations: An analysis was undertaken of the 'home' locations of the 271 vessels on the Gloucester principal port list. By 'home' location is meant simply the town or city indicated in the vessel owner address for the vessel (taken from the federal permit database with which the Gloucester principal port list was created). *This analysis of vessels' home locations should not be equated with an analysis of the 'home' locations of vessel owners (i.e., or fishing businesses).* As discussed in Part II, some businesses owned multiple vessels, and these businesses are over-represented on the vessel list (each vessel they own functions as a separate entry of the business on the list).

The 'home' locations of the 271 vessels on the 2003 Gloucester principal port list spanned 59 towns or cities in 8 states. Sixty-five percent (65%) of the vessels, however, had addresses in Gloucester, Massachusetts. Another 21% listed cities or towns within 1-30 driving miles from Gloucester, for a total of about 87% in Gloucester or within 30 driving miles of Gloucester. (The number of "driving miles" signifies the number of miles to drive from the center of the city or town listed to the center of Gloucester according to driving routes suggested in searching for directions on Google Maps, maps.google.com). Another 6% listed cities or towns within 31-50 driving miles from Gloucester, for a total of almost 93% in Gloucester or within 50 driving miles of Gloucester. Another 4% listed cities or towns from 51 to 100 driving miles from Gloucester, for a total of 97% in Gloucester or within 100 driving miles of Gloucester. Finally, 2% listed cities or towns between 101-200 driving miles from Gloucester, and

1% listed cities or towns from 1000-3100 driving miles from Gloucester. See the table below.

Distances from Gloucester (in driving miles) of the 'home' locations of all vessels on the Gloucester principal port list (fishing year 2003)

Distance from Gloucester	Number of vessels	Percent of vessels	Cumulative percent of vessels
0	177	65%	65%
1 to 10	22	8%	73%
11 to 20	30	11%	85%
21 to 30	6	2%	87%
31 to 40	6	2%	89%
41 to 50	10	4%	93%
51 to 60	2	1%	93%
61 to 70	6	2%	96%
71 to 80	0	0%	96%
81 to 90	0	0%	96%
91 to 100	1	0%	96%
101 to 110	1	0%	96%
111 to 120	1	0%	97%
121 to 130	1	0%	97%
131 to 140	2	1%	98%
141 to 150	1	0%	98%
151 to 160	0	0%	98%
161 to 170	0	0%	98%
171 to 180	0	0%	98%
181 to 190	1	0%	99%
191 to 200	0	0%	99%
201 to 210	1	0%	99%
1000 - 3100	3	1%	100%
	271	100%	

Notes:

1. "0" miles signifies that listed address is in Gloucester
2. "driving miles" calculated using Google Maps (maps.google.com)

Groundfish permit categories: In order to describe the permit categories of the groundfish permits on the vessels on the principal port list, it is (unfortunately!) necessary to discuss briefly the categories of groundfish permits in existence in fishing year 2003, the year for which the principal port vessel list was compiled. That year, federal regulations provided for 11 multispecies (groundfish) permit categories. All but one of these 11 permit categories were, technically speaking, commercial permit categories as all but one allowed the sale of fish caught under the permits. The one

exception was the “party/charter” permit category, which prohibited the sale of fish caught under the permit.³⁰

Of the 11 permit categories, seven were limited access permit categories that had been in effect since the mid-1990s; of these, six were **limited access days-at-sea (DAS) permit categories**, i.e., categories of permits which required the use of DAS and each permit of which carried a specific, vessel-specific DAS allocation (the number of DAS the vessel was permitted to use in the given fishing year).³¹ Vessels with permits in these six groundfish permit categories are treated, in the groundfish management plan, as the vessels constituting the “commercial” groundfish fishery and are subject to a common set of “commercial fishery management measures.”³² Not the least of these common measures is the requirement to use allocated DAS to fish for groundfish and the associated prohibition on fishing for groundfish when each year’s allocation of DAS has been used (see 50 CFR 648.82). Other common requirements include prohibitions on fishing in closed areas of ocean, some that are closed year-round and some that are closed part of the year each year (50 CFR 648.81), area-specific gear restrictions and specifications (for bottom trawl, gillnet, longline, and other gear types) (50 CFR 648.80 and 648.84), minimum fish sizes (50 CFR 648.83), stock-specific trip limits (50 CFR 648.86) and others.

In addition to the seven limited access permit categories that had been in effect since the mid-1990s (the six limited access DAS permit categories and the one other), there was, in 2003, a *new* limited access permit category. This was a **handgear permit category**. Up until August 1, 2002, this handgear permit category had been an *open access* permit category (i.e., new permits continued to be available in this category until August 1, 2002), but, as of that date, existing handgear permits became, effectively, limited access permits, as new regulations were issued providing that no handgear permits would be issued after August 1, 2002.³³ The rules governing the use of these

³⁰ Charter/party vessels, which carry passengers for hire (and so are commercial in that sense), are considered “recreational” vessels because the fishing that takes place from them is recreational, and, importantly, because regulations prohibit the sale of fish caught on such vessels when they are fishing under a party/charter permit (type “I”) (see 50 CFR 648.89(d) (10-1-2003 ed.)). None of the other 10 federal groundfish permit categories in effect in 2003 prohibited the sale of fish (see the table in the text following; today, too, the charter/party permit type is the sole groundfish permit type for which the sale of fish is prohibited (cf. 50 CFR 648.89(d))).

³¹ The seventh limited access permit category that had been in effect since the mid-1990s – the one that was not a limited access DAS permit category – was the “small vessel” permit category; this category had applied to eligible vessels that were 30 feet and smaller. Vessels with permits in this category were not limited to an allocation of DAS but were limited to a combined catch of cod, haddock, and yellowtail flounder of 300 pounds per trip (see table in the text, and 50 CFR 648.82.) (There were no vessels on the Gloucester principal port list with groundfish permits in this category; see text following.)

³² See, e.g., Amendment 13 to the Northeast Fishery Management Plan, Final Document, section 3.6 (“Commercial Fishery Management Measures”), p. I-83 (Dec. 18, 2003).

³³ Regulations that went into effect in 2002 -- in response to a court order mandating certain regulatory changes during an interim period in which the 10-year stock rebuilding plans and attendant

newly limited access handgear permits were a requirement that only handgear – rod and reel and handline -- be used to fish for groundfish, and a limit on the combined catch of cod, haddock, and yellowtail flounder to 300 lb per trip (and the combined catch of cod and yellowtail flounder to 200 lb per trip) (see 50 CFR 648.88(a), 10-01-2003 ed.). It should be pointed out that, as indicated, the sale of fish caught under a handgear permit was not prohibited, and so the permit category is, technically, a commercial groundfish permit category. Vessels with these handgear permits, however, are not subject to the “commercial fishery management measures” (the measures governing the limited access DAS vessels) but to measures directed specifically at the vessels with permits in the handgear permit category (the gear limitation and the possession limitations just described).³⁴

Finally, there were, in addition, three more groundfish permit categories in effect in 2003, but only one of them was a permit category for vessels targeting groundfish. This was the **charter/party permit category**. Unlike the permit categories described thus far, this was an open access permit category (i.e., new permits in the category were available to be issued). The charter/party permit enabled a vessel to take passengers for hire to fish for groundfish species, but it limited the gear that could be used to one line per angler, two hooks per line, and it prohibited the sale of fish caught under the permit (see 50 CFR 648.89, 10-01-2003 ed.). Like the vessels with handgear permits, the vessels with charter/party permits were not subject to the “commercial fishery management measures” (the measures governing the limited access DAS vessels) but to their own, charter/party-specific set of rules (the one line per angler, two hooks per line requirement, and the prohibition on the sale of fish). The remaining two groundfish permit categories in effect in 2003 were (a) an “open access” permit category for limited access scallop vessels enabling the scallop vessels to possess 300 lb of groundfish bycatch, 50 CFR 648.88(c), 10-01-2003 ed.), and (b) an open access permit category that was not actually a permit to fish for the 12 species (in 19 stocks) of groundfish that the other 10 “groundfish” permit categories allowed (i.e., cod, haddock, yellowtail flounder, etc.) but a permit to fish for certain separately regulated “small mesh” groundfish species (whiting, red hake, and offshore hake).

All 11 ‘groundfish’ permit categories in effect in fishing year 2003 are described in the table below³⁵:

regulations were being prepared – provided that no new handgear only permits would be made available after August 1, 2002. See 50 CFR 648.88 (10-1-2003 ed.).

³⁴ The characteristics of the handgear vessel owners’ groundfish fishery – including the extent to which and the manner in which this fishery should be understood as a “commercial” fishery – are among the questions to be addressed in the analysis of the data from the handgear vessel sample in the future.

³⁵ Most of these permit categories remain in effect in 2006; one change is that “fleet” DAS permits (“B” permits) have been eliminated and vessels formerly holding B permits now hold individual DAS (“A”) permits. See 50 CFR 648.82.

Multispecies (Groundfish) Permit Categories in Fishing Year 2003

Name	Type	Brief Description (not a full account of eligibility or use requirements)
<i>"commercial fishery" permit categories (limited access DAS permit categories in effect since the mid-1990s, including the 6 limited access DAS permit categories) :</i>		
A	individual DAS permit	a DAS permit for vessels that, based on fishing history, established entitlement to an individually determined number of annual DAS; permit required, among things, use of an electronic vessel monitoring system
B	fleet DAS permit	a DAS permit for vessels that did not establish entitlement to an "individual" DAS permit but otherwise met requirements for a DAS permit; in the initial allocation of fleet permits, all fleet permit holders were entitled to the same number of annual DAS; fleet DAS permits required, among other things, the use of a call-in system <i>or</i> an electronic vessel monitoring system
C	small vessel exemption permit	a "small vessel exemption" permit: a non-DAS limited access permit; applied only to vessels 30 feet and under; combined catch of cod, haddock, and yellowtail flounder may not exceed 300 pounds per trip
D	hook gear only permit	a "hook gear only permit": a fleet DAS permit that required the use of hook gears only: longlines, tub trawls, rod and reel, or handlines
E	combination permit	a DAS permit category for certain vessels participating in the limited access sea scallop fishery and the groundfish (multispecies) fishery
F	large mesh individual DAS permit	a DAS permit for fleet (type A) DAS permits electing to fish with large mesh
G	large mesh fleet DAS permit	a DAS permit for individual (type B) DAS permits electing to fish with large mesh
<i>handgear permits ("open access" permits made limited access permits as of August 1, 2002)</i>		
H	handgear permit	a permit category that was "open access" until August 1, 2002, on which date H permits were made available only to vessels that had previously held them or whose owners had applied for them before that date; vessels with H permits were required to use rod and reel or handline; limited to 300 lb of haddock, cod, and yellowtail flounder, combined per trip (but only 200 lb of cod and haddock, combined, per trip)
<i>charter/party permits (open access permits)</i>		
I	charter/party permit	an open access permit for vessels carrying passengers for hire; vessels limited to rod and reel or handline, each passenger limited to one line, two hooks; <i>the sale of fish caught is prohibited</i>
<i>miscellaneous permit categories (not for targeting cod, haddock, yellowtail , etc.)</i>		
J	multispecies bycatch permit for scallop permit holders	an open access permit for vessels with <i>limited access scallop permits</i> , enabling the possession of 300 pounds of groundfish; other restrictions also apply
K	small mesh multispecies permits	an open access permit for the "small mesh" groundfish species (whiting, red hake, offshore hake)
sources: 50 CFR 648.4, 648.82, 648.88, 648.99 (10-1-2003 ed.), and National Marine Fisheries Service, Northeast Regional Office, Fisheries Statistics Office, <i>Initial Vessel Application, Instructions for Northeast Federal Fishing Vessel Permits</i> (OMB# 0648-0202, revised 4/10/2007, expires 11/30/2009). See generally 50 CFR 648.80 - 648.97.		

Groundfish permit categories of the vessels on the Gloucester principal port list. Having described the groundfish permit categories in effect in fishing year 2003, the permit categories of the vessels on the 2003 principal port list may now be described. As the table below shows, 145 of the vessels with groundfish permits and Gloucester as principal port in 2003, or 54% of the vessels (145/271), had permits in the limited access permit categories in effect since the mid-1990s. (As shown below, moreover, all of these 145 vessels had limited access DAS permits.) The remaining 46% of the vessels with groundfish permits and Gloucester as principal port in 2003, 126 vessels out of 271, had permits in the handgear, charter/party, or small mesh (whiting, etc.) categories, or some combination of permits in these categories.

Breakdown of Groundfish Permit Categories on the Vessels on the Gloucester Principal Port List (the list of all vessels with groundfish permits in 2003 and Gloucester as principal port) (271 vessels total)		
<i>Permit categories</i>	number of vessels	percent of all groundfish permitted vessels with Gloucester as principal port in 2003
all vessels with permits in limited access categories in effect since the mid-1990s (permit categories A-G)	145	54%
all vessels with permits in categories H, I, J, or K (H, I, and K permits could be combined)	126	46%

The 145 vessels with limited access DAS permits in 2003

Limited access DAS permit types of the 145 vessels: The 145 vessels with permits in one of the limited access permit categories in effect since the mid-1990s had permits as follows: 11% (16/145) had type “A” individual DAS permits, 77% (112/145) had type “B” fleet DAS permits, 8% (12/145) had type “D” hook only (longline, tub trawl, etc.) DAS permits and 3% (5/145) had type “F” or type “G” “large mesh” DAS permits. All thus had limited access DAS permits (none had type “C” permits).

Vessel lengths of the 145 vessels: The vessel lengths of the 145 vessels with limited access DAS permits in 2003 and Gloucester as principal port are shown in the tables and chart below. As shown, the median length was 48 feet, the minimum length

was 18 feet and the maximum was 111 feet. Seventy-eight percent (78%) of the vessels were 60 feet or smaller, and 89% of the vessels were 70 feet or smaller.³⁶

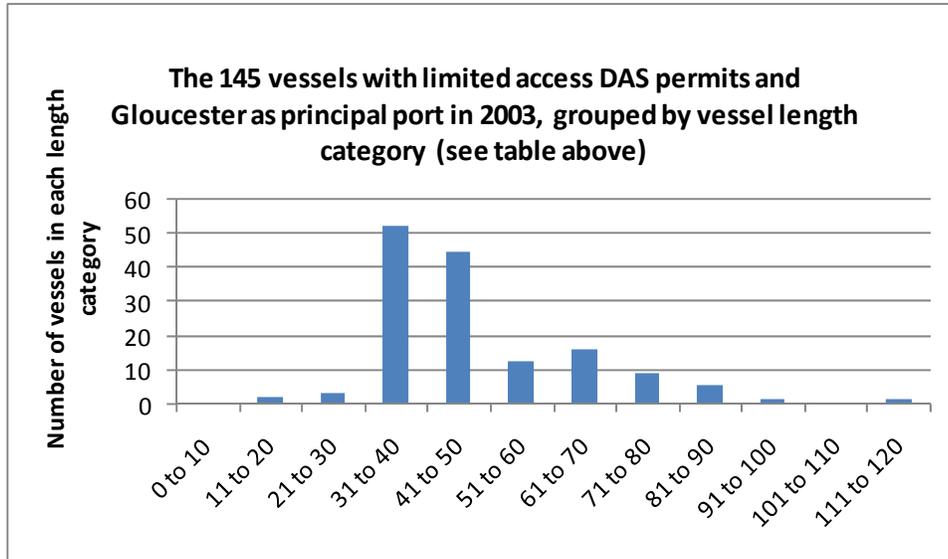
Vessel lengths of the 145 vessels with limited access DAS permits and Gloucester as principal port in 2003 (lengths in feet) (see text)

	mean length	median length	minimum length	maximum length	range (max - min)
all vessels with limited access DAS permits and Gloucester as principal port in 2003	48.2	42	18	111	93

Vessel lengths for the 145 vessels with limited access DAS permits and Gloucester as principal port list in fishing year 2003

<i>Length category (feet)</i>	<i>Number of vessels</i>	<i>Cumulative number of vessels</i>	<i>Percent of vessels</i>	<i>Cumulative percent of vessels</i>
0 to 10	0	0	0%	0%
11 to 20	2	2	1%	1%
21 to 30	3	5	2%	3%
31 to 40	52	57	36%	39%
41 to 50	44	101	30%	70%
51 to 60	12	113	8%	78%
61 to 70	16	129	11%	89%
71 to 80	9	138	6%	95%
81 to 90	5	143	3%	99%
91 to 100	1	144	1%	99%
101 to 110	0	144	0%	99%
111 to 120	1	145	1%	100%

³⁶ Moreover, of the 11% of vessels over 70 feet (16/145), five vessels were charter/ party vessels that, for some reason, did not have charter/party permits but, instead, had type B, fleet DAS limited access permits. Removing these five charter/party vessels from the limited access DAS subset leaves only 11/140 vessels, or 8% of the limited access DAS vessels, over 70 feet in length. (The fact that the five vessels were party/charter vessels was gleaned through ethnographic work.)



The 126 vessels with groundfish permits other than limited access DAS permits (handgear, charter/party, etc.) in 2003:

Permit categories of the 126 vessels: The 126 groundfish permitted vessels with Gloucester as principal port in 2003 that did *not* have limited access DAS permits consisted, in the main, of vessels with handgear permits: Ninety percent (90%) of these vessels (114/126) had handgear permits. Twenty percent (20%), or 25/126, had charter/party permits, and 32% had small mesh (whiting, etc.) permits (see the permit category table above for information on these permit types). Note that handgear, charter/party, and small mesh (whiting, etc.) permits could be, and were, combined, and therefore the percentages of each of these permit types do not sum to 100%. See the table below.

Groundfish permit categories on the 126 vessels with Gloucester as principal port in 2003 with groundfish permits other than limited access DAS permits vessels		
<i>permit types</i>	number of vessels	percent of all vessels with groundfish permits other than non-limited access DAS permits*
all vessels with permits in handgear category (permit category H), with or without other I or K permits	114	90%
all vessels with permits in charter/party category (permit category I), with or without H or K permits	25	20%
all vessels with "J" permits	0	0%
all vessels with "K" permits, with or without H or I permits	40	32%
<i>* H, I, K permits could be (and were) combined, so percents do not sum to 100%</i>		

Vessel lengths of the 126 vessels: The vessel lengths for the 126 vessels with groundfish permits other than limited access DAS permits are shown below. As shown, the median length of all 126 vessels is 28 feet, and the median length of the handgear permitted vessels (all vessels with handgear (H) permits, whether or not they also have I or K permits) was 26 feet. Hence, the 126 vessels – and the handgear vessels taken alone – are considerably smaller than the vessels with limited access DAS permits. For the latter, the median length was 42 feet (see the limited access DAS vessel length table above).

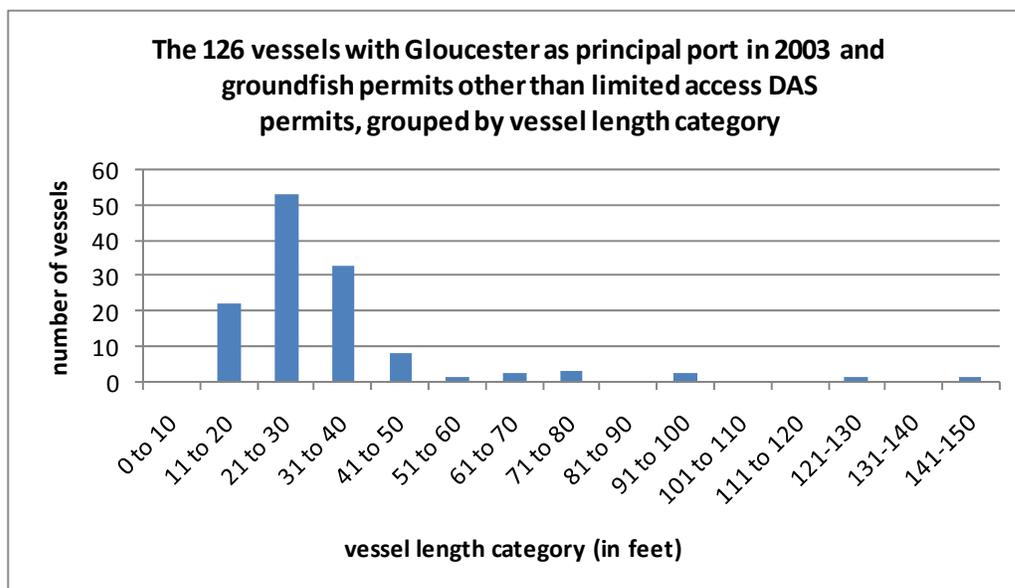
Vessel lengths of the 126 vessels with groundfish permits *other than* limited access DAS permits and Gloucester as principal port in 2003 (lengths in feet)

	mean length	median length	minimum length	maximum length	range (max - min)
all 126 vessels	33	28	14	141	127
all handgear permit vessels (114 total)	32	26	14	141	127

The predominance of very small vessels in the group of 126 vessels with groundfish permits other than the limited access DAS permits can also be seen in the table and chart below. Sixty percent (60%) of the vessels are 30 feet or smaller, and 86% are 40 feet or smaller.

Vessel lengths for the 126 groundfish vessels with Gloucester as principal port in 2003 and with groundfish permits *other than* limited access DAS permits

Length category (feet)	Number of vessels	Cumulative number of vessels	Percent of all vessels	Cumulative percent of all vessels
0 to 10	0	0	0%	0%
11 to 20	22	22	17%	17%
21 to 30	53	75	42%	60%
31 to 40	33	108	26%	86%
41 to 50	8	116	6%	92%
51 to 60	1	117	1%	93%
61 to 70	2	119	2%	94%
71 to 80	3	122	2%	97%
81 to 90	0	122	0%	97%
91 to 100	2	124	2%	98%
101 to 110	0	124	0%	98%
111 to 120	0	124	0%	98%
121-130	1	125	1%	99%
131-140	0	125	0%	99%
141-150	1	126	1%	100%



2. The Limited Access DAS Sample and the Handgear Sample

The decision to create two separate samples: It was decided, initially, that a single simple random sample would be created, comprised of owners of vessels with groundfish permits in any groundfish permit category, i.e, to create a simple random sample drawn from the 271 vessels on the Gloucester principal port list created for the study . After interviewing had begun, however, it was decided to create *two* simple random samples, one comprised solely of owners of vessels with limited access DAS permits (permit types A, B, D, E, F, G) and the other comprised solely of owners of vessels with handgear permits (permit type H). This decision resulted from the recognition that, either, two separate samples were necessary (one of limited access DAS vessels and one of handgear vessels), or, the mixed sample (of limited access DAS permits and handgear permits) would have to be significantly larger than originally planned. As shown above, the Gloucester principal port list was 54% limited access DAS vessels and 46% vessels with groundfish permits other than limited access DAS permits (90% of which, or 42% overall, were handgear permits). It was recognized that these two dominant sets of vessels on the principal port list – the limited access DAS vessels (145/ 271) and the handgear vessels (114/271) – were systematically different in multiple respects. Rather than trying to characterize the two sets of vessels through one, large sample, it was decided to create two separate samples to characterize the two sets of vessels.

It is important to note that, as indicated earlier, both sets of vessels were, technically, commercial vessels, in that both sets of permits (the limited access DAS permits and the handgear permits) allowed the sale of fish caught under the permit. Nonetheless, there were three systematic differences between the limited access DAS vessels and the handgear vessels, warranting their separation into separate samples. First, as described earlier, the two sets of vessels were subject to significantly different regulatory restrictions: The limited access DAS vessels could use bottom trawl, gillnets, longlines, and other gears; in addition, they had trip limits (where there were trip limits) substantially larger than the trip limits imposed on the handgear vessels (the exceptions were two of three yellowtail flounder stocks). That said, however, the limited access DAS vessels were required to use DAS to fish for groundfish, to stay out of year-round and seasonal closed areas (including “rolling closures” that roll down the inshore through the course of the year), to meet extensive and detailed gear specifications and restrictions, and to meet various other requirements. The handgear vessels, by contrast, were required to use handgear (rod and reel or handline) and were limited to 300 pounds of cod, haddock, and yellowtail flounder combined (and 200 pounds of cod and yellowtail flounder combined). Second, these regulatory differences were reflected in another difference between the two sets of vessels: their size. As shown above, the mean length of the limited access DAS vessels was 48 feet, while the mean length of the handgear vessels was 32 feet; 30% of the limited access DAS vessels were above 50 feet in length, whereas only 8% of the handgear vessels were above 50 feet in length. (See the tables in section 1 above.) Finally, third, the owners of the two sets of vessels had, arguably, systematically different histories in the groundfishery: To have owned a vessel with a limited access DAS groundfish permit in 2003, a vessel

(business) owner had either to have held a then-open-access groundfish permit in 1991 and to have had groundfish landings the year before (1/90-2/91) – the qualifying criteria for a limited access DAS permit when the limited access DAS permits were first created and allocated, in 1994 – or to have purchased or been transferred a limited access DAS permit (a complex process involving the purchase or receipt of a vessel with a limited access DAS permit) at some point after 1994 and before 2003.³⁷ By contrast, to have owned a vessel with a handgear permit in 2003, a vessel owner would simply have had to have applied for the then-open-access permit anytime before August 1, 2002.

Creating the two samples; response rates: Three successive draws were made, using computerized random sample generators, to create the two samples, the limited access DAS sample and the handgear sample. The first draw was from the principal port list, the list of 271 vessels that identified Gloucester as principal port and had a groundfish permit, in any groundfish permit category (permit types A, B, C, D, E, F, G, H, I, J, K), in 2003. The second and third draws were from the subset of 145 vessels that identified Gloucester as principal port and had a *limited access DAS* groundfish permit (permit types A, B, D, E, F, or G), in 2003.

Draw one (from the list of 271) was for 20 vessels; of the 20, 7 were vessels with limited access DAS permits (all 7 were type “B,” fleet DAS permits), and 13 were handgear permitted vessels (all 13 had H permits, and 4 of the 13 also had K permits). Of the 7 limited access DAS permitted vessels in draw one, the owners of all 7, or 100%, were interviewed. Of the 13 handgear permitted vessels in draw one, the owners of 7, or 54%, were interviewed. We did not make extensive efforts to interview the owners of the remaining 6 handgear vessels in draw one. Instead, we decided to separate the original sample into two separate samples – a limited access DAS sample and a handgear sample – and to put our efforts into expanding the limited access DAS sample.

Draw two (from the list of 145 limited access DAS permitted vessels) was for 8 vessels; of these, the owners of 6, or 75%, were interviewed; one owner was deceased (the vessel and permit had since passed to his grandson, who had not owned or operated the vessel in 2003), and one owner had left the fishing industry and did not respond to repeated interview requests over several weeks. Finally, draw three (also from the list of 145 limited access permitted vessels) was for 11 vessels; of these, 3 owners, or 27%, were interviewed. Of the remaining 8 vessels in draw three, one vessel owner (9%) declined the interview, and, for the 7 others, it was decided that efforts to pursue the interviews would not be continued as the sample of 16 owners of limited access DAS vessels garnered by that time was sufficient for analysis.³⁸

³⁷ See Amendment 5 to the Northeast Multispecies Fishery Management Plan, Final Rule, 59 FR 9872 (March 1, 1994).

³⁸ See the discussion of the interview process above.

Converting the sample of limited access DAS vessels into a sample of business owners owning limited access DAS vessels: As described in Part II above, once the two vessel samples were created (from the principal port list and the principal port sublist of 145 limited access DAS vessels), it was necessary to convert these vessel samples into, essentially, business samples. This was done as indicated, by identifying owners of the vessels, obtaining interviews with them, and, via the survey instrument that guided the interviews, asking them about all commercial fishing activities they had undertaken in the years inquired into, both on the vessel whose name had appeared in the vessel sample (and thereby drawn the owner into the business sample) and on any other vessels owned and/or fished by the owner.

As indicated, also, the study put a priority on investigating the limited access DAS sample: Additional vessels were drawn to expand the limited access DAS vessel sample; interviewing efforts focused on the owners of these vessels; and this write-up analyzes data from this sample.³⁹ What follows below is a description of the limited access DAS sample. This includes a description of the set of limited access DAS vessels owned by the owners in the limited access DAS sample, and a comparison of these limited access DAS vessels with the full set of limited access DAS vessels on the Gloucester principal port list (the 145 vessels with limited access DAS permits).

The limited access DAS sample: Sixteen limited access DAS vessel owners (i.e., 16 commercial groundfish business owners) were interviewed. It is not possible to determine the percentage of the total number of (unique) limited access DAS vessel owners (i.e., businesses) in Gloucester in 2003 that this sample of 16 represents. This is because, as was described in the methods section (Part II), we do not know the total number of limited access DAS vessel owners (i.e., businesses) operating out of Gloucester in 2003; we know only the total number of limited access DAS vessels operating out of Gloucester in 2003 (assuming we can use the limited access DAS vessels on the 2003 principal port list created for the study as this number, an assumption that carries the caveats discussed in Part II). That said, we can say with certainty that the vessel owner/business sample constitutes a sample of *at least* 11% of the limited access DAS vessel/business owners owning limited access DAS vessels with Gloucester as principal port in 2003: If we assume that each vessel on the list of 145 limited access DAS vessels represents a unique fishing business (an assumption we know to be too conservative, on the basis of this study itself), we can say (again, overly conservatively) that the sample of 16 limited access DAS vessel owners (businesses) constitutes a sample of 11% (16/145) of the owners (businesses).

As described in further detail in the discussion of the data obtained from the interviews of the limited access DAS vessel owners (in section 3 below), these 16 vessel (business) owners owned, in 2003, individually or jointly with others, 30 commercial fishing vessels. Twenty-nine (29) of these vessels were limited access DAS vessels, and all 29 had Gloucester as “principal port” in 2003. The data analyzed

³⁹ As indicated, the data from the interviews of the random sample of handgear vessel owners (a sample of 7 owners, some with multiple vessels) will be analyzed and presented at a later time.

below concerns, among other things, the operations of these 29 vessels in 2003. These 29 vessels comprise 20% of the limited access DAS vessels with Gloucester as principal port in 2003 (29/145).

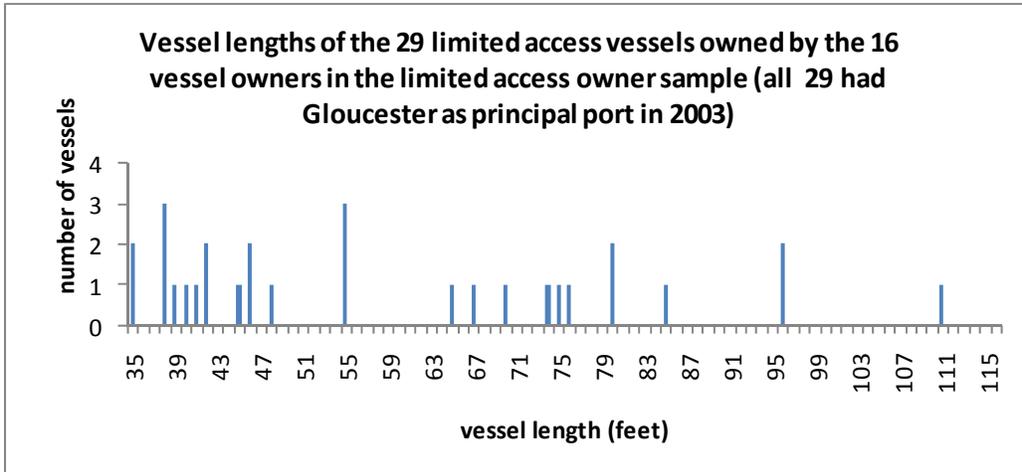
The limited access DAS permit types of the 29 limited access DAS vessels owned by the businesses in the sample, as well as the lengths of these 29 vessels, are presented below and compared with the limited access DAS permit types and vessel lengths of the full set of limited access DAS vessels on the Gloucester principal port list (i.e, the subset of 145 vessels with limited access DAS permits). As shown below, the 29 vessels owned by the business owners in the sample were larger, on average, than the full set of limited access DAS vessels on the principal port list (the sub list of 145 limited access DAS vessels), and had a greater percentage of type “A” individual DAS permits than the full set of limited access DAS vessels.

Permit types on the 29 limited access DAS vessels owned by the vessel (business) owners in the sample: The 29 limited access groundfish vessels owned by the vessel (business) owners in the sample (and with Gloucester as principal port) had the following limited access DAS permits: Seventeen percent (17%) had type A permits (5/16); 79% had type B permits (23/29), and 3% had type D permits (1/29). None had F or G permits (large mesh DAS).⁴⁰ The comparison with the permit types on the full set of limited access DAS vessels on the principal port list is as follows:

LIMITED ACCESS VESSELS - PERMIT TYPES				
limited access permit type	principal port list		sample	
	number	% of all limited access permits on principal port list	number	% of all limited access permits in sample
A (individual DAS)	16	11%	5	17%
B (fleet DAS)	112	77%	23	79%
D (hook only DAS)	12	8%	1	3%
F or G (large mesh DAS)	5	3%	0	0%
<i>sum</i>	145	100%	29	100%

Vessel lengths of the 29 limited access DAS vessels owned by the vessel (business) owners in the sample: The vessel lengths of the 29 limited access DAS vessels with Gloucester as principal port owned by the vessel (business) owners in the sample are shown below:

⁴⁰ As indicated earlier, there were no C or E permits on the Gloucester principal port list for 2003.



The mean of the vessel lengths of the 29 vessels was 59 feet, and the median 55. Both mean and median were larger than the mean and the median of the full set of 145 limited access DAS vessels on the Gloucester principal port list in 2003; the mean of the full set was 48, and the median of the full set was 42.

LIMITED ACCESS VESSELS - VESSEL LENGTHS		
	principal port list (n=145)	sample (n=29)
mean	48	59
quartile 1	38	41
median	42	55
quartile 3	57	75
minimum	18	35
maximum	111	111
range	93	76

That there were, proportionally, more large vessels in the set of 29 limited access DAS vessels owned by the vessel (business) owners in the sample than there were in the full set of 145 limited access vessels on the principal port list is also seen below, in a comparison of vessel length distributions. As highlighted below, 70% of the vessels in the full set of 145 limited access vessels were 50 feet or smaller, while only 48% of the set of 29 vessels owned by the vessel owners in the sample were 50 feet or smaller. Hence, 30% of the vessels in the full set were over 50 feet, while 52% of the vessels in the set of 29 were over 50 feet.

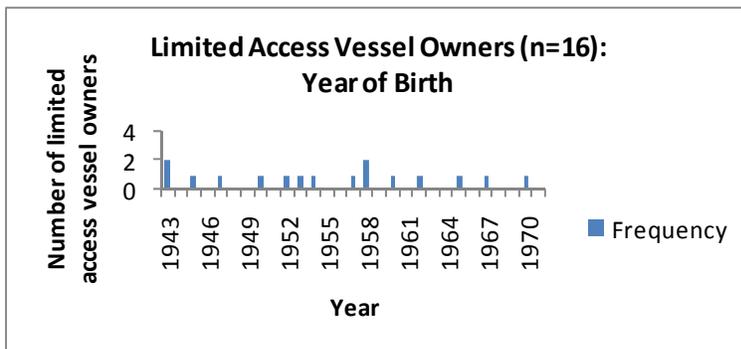
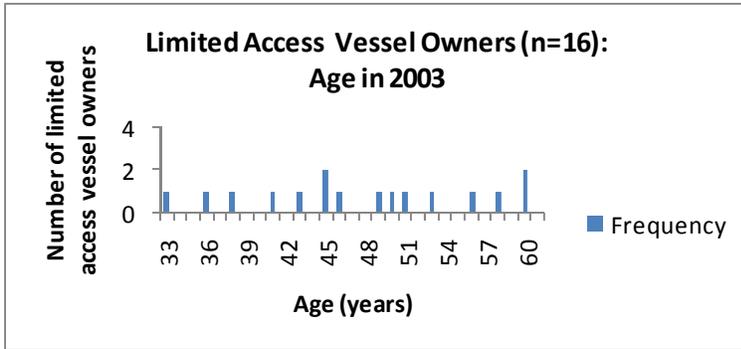
ALL LIMITED ACCESS VESSELS ON 2003 GLOUCESTER PRINCIPAL PORT LIST				ALL LIMITED ACCESS VESSELS IN SAMPLE			
Length (feet)	number of vessels	percent of all vessels	cumulative percent	Length (feet)	number of vessels	percent of all vessels	cumulative percent
0 to 10	0	0%	0%	0 to 10	0	0%	0%
11 to 20	2	1%	1%	11 to 20	0	0%	0%
21 to 30	3	2%	3%	21 to 30	0	0%	0%
31 to 40	52	36%	39%	31 to 40	7	24%	24%
41 to 50	44	30%	70%	41 to 50	7	24%	48%
52 to 60	12	8%	78%	52 to 60	3	10%	59%
61 to 70	16	11%	89%	61 to 70	3	10%	69%
71 to 80	9	6%	95%	71 to 80	5	17%	86%
81 to 90	5	3%	99%	81 to 90	1	3%	90%
91 to 100	1	1%	99%	91 to 100	2	7%	97%
101 to 110	0	0%	99%	101 to 110	0	0%	97%
111 to 120	1	1%	100%	111 to 120	1	3%	100%
	145	100%			29	100%	

3. The Limited Access DAS Vessel (Business) Owner Sample Analyzed:

a. Personal characteristics of the limited access DAS vessel owners:

Gender of the limited access DAS vessel owners: One hundred percent (100%) of the limited access DAS vessel owners in the sample were male. However, as shown below, some owned their businesses and/or their vessels with their spouses.

Age in 2003 and year of birth: The limited access DAS vessel owners' ages in 2003 ranged from 33 (born in 1970) to 60 (born in 1943), a range of 27 years. The mean age was 48 (born in 1955). The median was also 48; the first quartile was 43 (born in 1960); and the third quartile was 54 (born in 1949). The ages of the limited access DAS vessel owners in the sample, and their years of birth, are shown below:



Place of birth: Approximately one-third (31%) of the 2003 limited access DAS vessel owners were born in Gloucester, and another near one-third (31%) were born within 31 driving miles of Gloucester, for a total of nearly two-thirds (62%) born in or within 31 driving miles of Gloucester. Another 13% were born in neighboring states in locales between 120 and 170 driving miles of Gloucester. Seventy-five percent (75%), therefore, were born in, or within 170 driving miles of, Gloucester. Twenty-five percent (25%) were born outside of the United States, in towns in Sicily, Italy (three near Palermo and one near Siracusa), about 4300 miles from Gloucester.

Place(s) of residence, 2003, 1993, 1983: Sixty-three percent (63%) of the 2003 limited access DAS vessel owners lived in Gloucester in 2003. Another 25% lived within 20 driving miles of Gloucester in 2003, for a total of 88% living in Gloucester or within 20 driving miles of Gloucester. Six percent (6%) lived within 70 driving miles of Gloucester in 2003, and another 6% lived within 120 driving miles of Gloucester in 2003.

Of the limited access DAS vessel owners living in Gloucester in 2003, all of them (100%) had also lived in Gloucester in 1993 and 1983. Of those living within 20 driving miles of Gloucester in 2003, 100% had also lived within 20 driving miles of Gloucester in 1993 and 1983 (one lived within Gloucester itself during 1983). The 6% living within 70 miles of Gloucester in 2003 had lived, in 1993 and 1983, within 20 driving miles of Gloucester, while the 6% living within 120 miles of Gloucester in 2003 lived within 120 miles of Gloucester in 1993 and 1983. Thus, in all, there was remarkable consistency in

place of residence in the three years inquired into in the study, three years that, as indicated, spanned a period of 21 years. For only one of the 16 in the sample (about 6%) was there an indication of a major change in place of residence (the shift from a locale within 20 driving miles of Gloucester to one within 70 miles of Gloucester). For all others, indications were that they either stayed in Gloucester, stayed within 20 driving miles of Gloucester, or, in the case of the single owner 120 miles from Gloucester, in that same locale 120 miles from Gloucester.

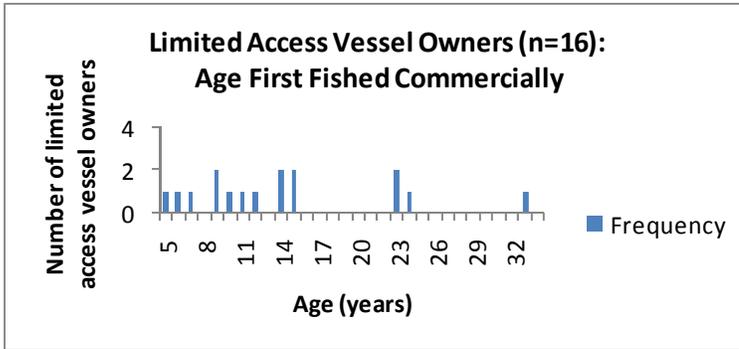
Finally, the limited access DAS vessel owners living in Gloucester in 2003 (and, as indicated, in 1993 and 1983) included among them *all* the limited access DAS vessel owners who were *born* in Gloucester. That is, the five 2003 limited access DAS vessel owners in the sample who were born in Gloucester also lived in Gloucester in 2003, 1993, and 1983; none had left (or if they had left, they had also returned).

Sicilian-Americans among the 2003 limited access DAS vessel owners: As indicated, 4/16, or 25%, of the 2003 limited access DAS vessel owners were born in Sicily. In addition, another 4/16, or 25%, had at least one parent or grandparent born in Sicily who had migrated to Gloucester. Thus, 50% of the limited access DAS vessel owners (8/16) were either first, second, or third generation Sicilian-Americans; “Sicilian-American” is defined here as someone living in the United States who either, was born in Sicily, or, had at least one parent or grandparent who migrated to the United States from Sicily.

All of the 2003 limited access DAS vessel owners who were second or third generation Sicilian-American were born in Gloucester, and lived in Gloucester in 1983, 1993, and 2003. In addition, all of the 2003 limited access DAS vessel owners who were first generation Sicilian-Americans (i.e., who were born in Sicily) also lived in Gloucester in 1983, 1993, and 2003. As such, then, none of the 2003 limited access DAS vessel owners who were first, second, or third generation Sicilian-Americans lived outside Gloucester in any of the years inquired into (2003, 1993, and 1983). Instead, all lived *inside* Gloucester in each of those years. Further, the Sicilian-Americans (first, second, and third generation) comprised a large majority of the 2003 limited access DAS vessel owners who were living in Gloucester in those years (80% in 2003 and 1993, and 73% in 1983).

b. Fishing careers of the limited access DAS vessel owners:

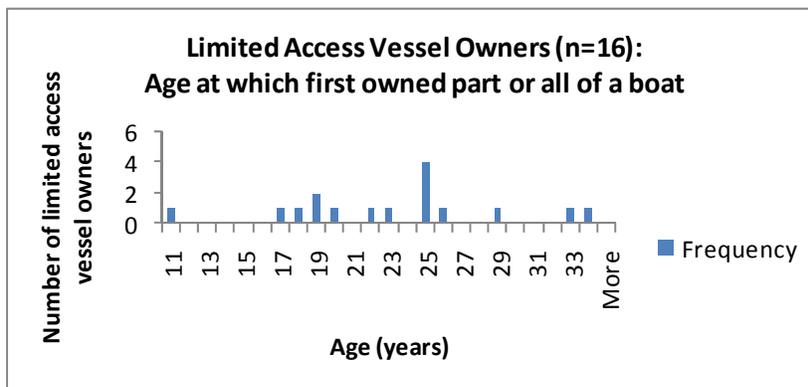
Age first fished: The youngest age at which a 2003 limited access DAS vessel owner first fished commercially was 5 years old (the question was interpreted by some as the age first *on* a commercial vessel); the oldest age at which a 2003 limited access DAS vessel owner first fished commercially was 33 years old. The mean was 14 years of age, and the median 13 years of age.



Fishermen in the preceding generation: Sixty-nine percent (69%, or 11/16) of the 2003 limited access DAS vessel owners were born into families in which at least one member of the preceding generation in the family (usually the father) was a commercial fisherman; 31% were not born into such families. Of the 69% born into families with a fisherman in the immediately preceding generation, some hailed from families of several generations of commercial fisherman (e.g., “since forever, that I know of”) and/or had multiple commercial fishermen in preceding generations of their families.

Learning fishing from family members: Sixty-three percent (63%, or 10/16) of the 2003 limited access DAS vessel owners learned commercial fishing from family members (fathers, uncles, and grandfathers). Notably, also, of the 37% that learned commercial fishing from non-family members, 33% (13% of the owners overall) learned from a “mentor” whom they analogized to a family member (e.g., “he was like a father to me”).

Age first owned a boat: The youngest age at which a 2003 limited access DAS vessel owner was either owner or part owner of a commercial fishing vessel was 11 years old; the oldest age at which a 2003 limited access DAS vessel owner first owned a commercial fishing vessel (or part of one) was 34 years old. The mean age was 23 years old, and the median was 24 years old; see below:



Careers in commercial fishing: Sixty-four percent (63.5%), or 10/16, of the 2003 limited access DAS vessel owners had, from the start of their commercial fishing careers, not worked for more than one year in any work outside of commercial fishing.

Thirty-eight percent (37.5%), or 6/16, of the 2003 limited access DAS vessel owners had worked, for one year or more, at work outside of commercial fishing since they had begun fishing. However, for 83% of these owners (5/6), or 31% of the owners overall, the work outside commercial fishing consisted of a brief hiatus in a fishing career: thus, one worked on commercial fishing vessels in summers during high school, worked as a carpenter for three years after high school, and then returned to commercial fishing; one worked in a gas station for one year between fisheries; one worked as a welder for a year after his vessel sank, then returned to fishing; one drove a truck for a year after he lost all his gear in a storm (producing the funds needed to replace the gear); and one rode out a dispute within his family's fishing business by working as a carpenter for a year, returning to fishing after building two houses. For one vessel owner (constituting 17% of the vessel owners working outside commercial fishing, or 6% of the owners overall), however, work outside of commercial fishing was not a hiatus in a commercial fishing career, but, rather, his mainstay. This vessel owner had owned and run three small businesses ashore, two of which were support industries for the commercial fishing industry (in 2003, he continued to own and run two of the three businesses). In addition to these shore-side businesses, however, he had (with others) owned and run a commercial vessel for a brief period in the 1980s; and, in 2003, he had re-entered the commercial fishing industry, becoming once again the owner of a commercial fishing vessel.

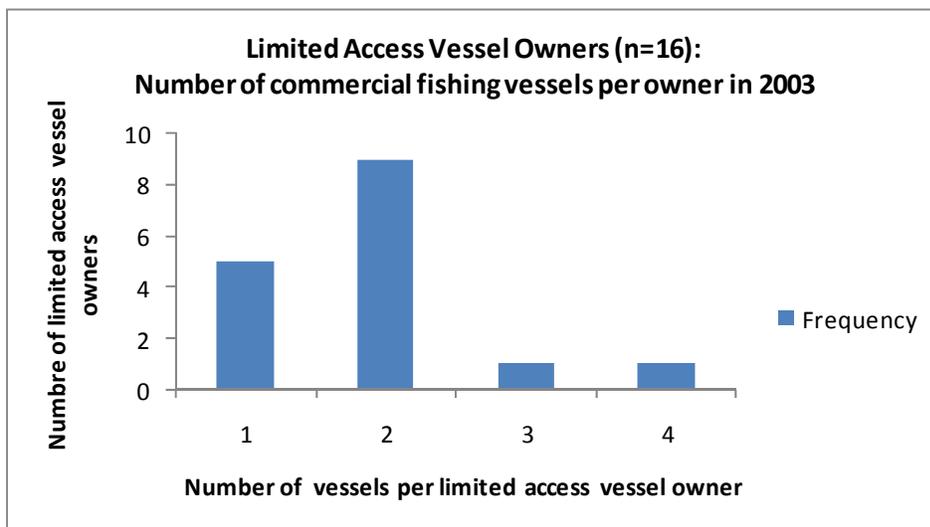
In addition to asking vessel owners whether they had worked for a year or more outside of commercial fishing since they had begun commercial fishing, the project also asked vessel owners whether they had owned or run any businesses other than commercial fishing businesses in any of the three years investigated in the study, 2003, 1993, or 1983. Thirty-one percent (31% or 5/16) did own some kind of enterprise outside of fishing while also owning and running a fishing business in at least one of the years asked about *or in a year close in time to one of the years asked about*. One was the vessel owner described above, who had owned and run three small businesses ashore, two of them fishing support businesses; for this vessel owner, the commercial fishing business was adjunct to his shoreside businesses. The second was a vessel owner who had integrated multiple marine businesses with his commercial fishing business; over the years, he had (together with family partners and others) businesses buying, refurbishing, and re-selling commercial vessels; delivering commercial vessels from one distant port to another (all through the Caribbean and as far south as Venezuela); and running and leasing vessels to carry small pelagics (herring and menhaden) from fishing vessels to processing sites, both onshore and offshore, along the New England coast. The third was a vessel owner who, together with others, had invested in buying and operating a piece of commercial real estate; for this vessel owner, the shoreside undertaking was strictly adjunct to his commercial fishing business. Fourth was a vessel owner who had started, with a family member, a seafood company, buying fish from vessels and selling fish to restaurants and other

small buyers; after a short time, he had turned over his interest in the business to his family member/ partner; for this vessel owner, too, this shoreside business was strictly adjunct to his commercial fishing business. Fifth was a vessel owner who had attempted day-trading while fishing (and operating his fishing business).

Most but not all of the limited access DAS vessel owners began their commercial fishing careers as crew on vessels owned by others (family members' vessels in some cases, non-family members' vessels in others); some, however, began their fishing careers captaining their own vessels.⁴¹ In 2003, one limited access DAS vessel owner in the sample combined captaining his own vessel with working as crew on another's vessel (a vessel owned by an owner not in the sample).

c. Business structures and practices in 2003:

Number of vessels owned in 2003: In 2003, the 16 limited access DAS vessel owners, among them, held ownership interests in 30 commercial fishing vessels. They held these interests either by themselves (i.e., individually) or with others (the patterns of individual and joint ownership are described below). Each limited access DAS vessel owner in the sample owned (individually or jointly) from one to four commercial fishing vessels in 2003. The median number of vessels held was 2, while the mean was 1.9. The distribution of the number of vessels owned (individually or jointly) per vessel owner is seen below:



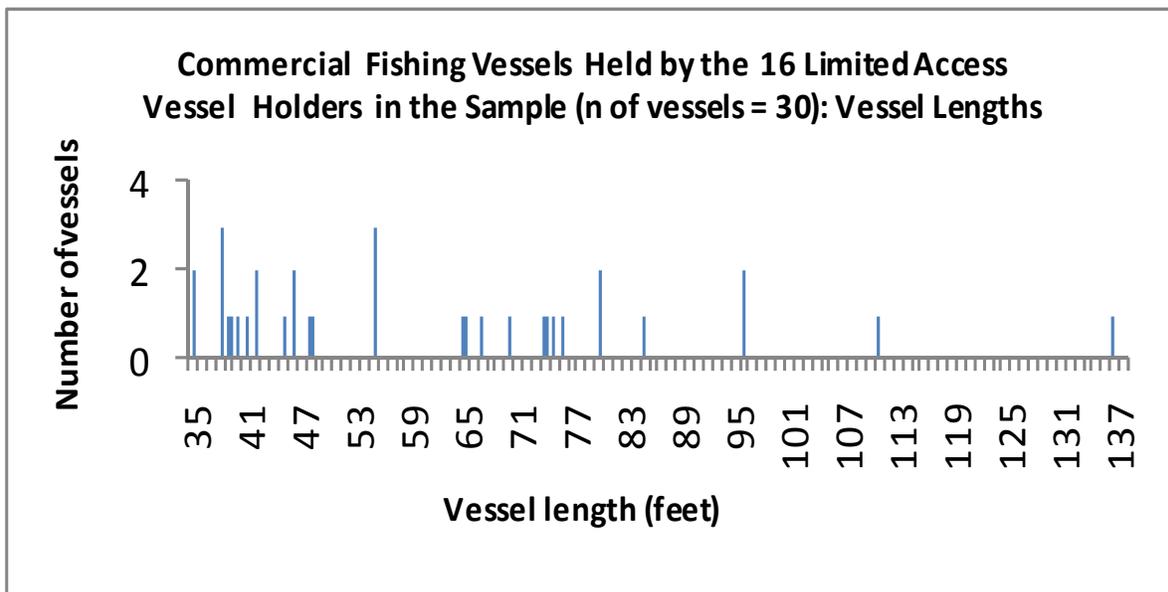
In examining these data, it is important to remember that some of the 30 vessels were owned individually and some jointly; therefore, the 16 limited access DAS vessel owners in the sample do not comprise the full set of owners of these 30 vessels. (Unfortunately, the data are insufficient to allow a determination of the full number of

⁴¹ More detailed analysis of these points will accompany the analysis of the 1983 and 1993 data.

owners of these 30 vessels; however, proportions of sole and joint ownership – and types of joint ownership – are described in analyses below.)

Groundfish permits on the vessels owned in 2003: As discussed in Part II, 29 of the 30 vessels owned by the limited access DAS vessel owners in 2003 had limited access DAS permits (and Gloucester as principal port). As indicated in Part II, the permit category breakdown of the limited access DAS permits on these 29 vessels was as follows: 17% had type A permits (5/16); 79% had type B permits (23/29), and 3% had type D permits (1/29).

Sizes of the vessels owned in 2003: The 30 vessels owned by the 16 limited access DAS vessel owners ranged in length from 35 feet to 137 feet, a range of 132 feet. The median was 55 feet; the first quartile was 41 feet, and the third quartile was 75 feet. The mean was 62 feet. The distribution of vessel lengths is displayed below.



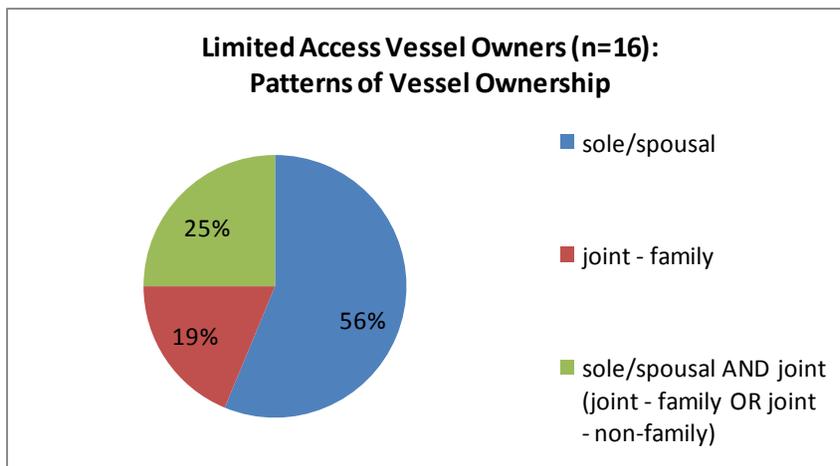
Patterns of vessel ownership in 2003: The limited access DAS vessel owners held their ownership interests either directly (by owning a vessel outright) or indirectly (by forming a business corporation to own the vessel and owning the shares in that business corporation). As indicated, vessel owners held these interests (in the vessel, or, if the vessel is owned by a corporation, in the vessel that owns the corporation) either individually or jointly.⁴² There were three patterns to joint ownership of vessels: (1) joint ownership by husband and wife; (2) joint ownership by business partners who were also family members; this pattern could include spouses *but was not limited to spouses* (typical cases include brothers or brothers-in-law); and (3) joint ownership by

⁴² Joint ownership usually entails the creation of a corporation to hold the vessel and the assignment of shares in the corporation to each of the joint owners.

business partners who are *not also family members* (this pattern could, however, also include spouses; what distinguishes it is that it includes non-family partners).

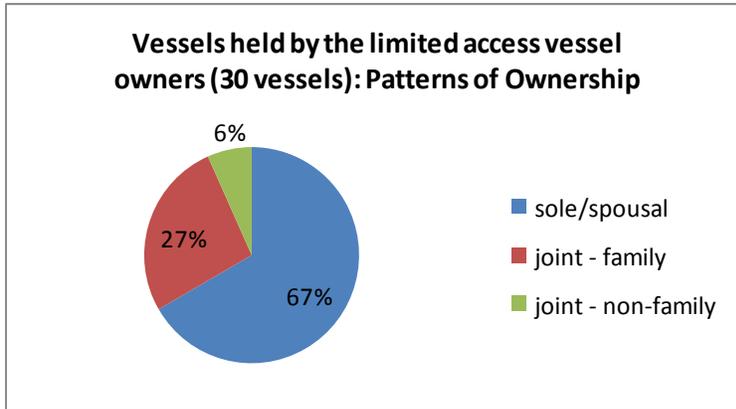
For the purpose of analyzing the distribution of ownership patterns among the 2003 limited access DAS vessel owners, sole ownership and spousal ownership were collapsed into one category (sole/spousal) and compared with joint ownership by family members (non-spousal family members, i.e., type 2 above) and joint ownership by non-family members (type 3 above).⁴³

Of the 16 limited access vessel holders in the sample, 56% (9/16) held their vessel(s) in sole or spousal ownership; 19% (3/16) held their vessel(s) in joint family ownership (type 2); and 25% (4/16) – all of whom held multiple vessels – held their vessels in a combination of sole/spousal and joint ownerships (joint family or joint non-family, types 2 and 3 above).



Of the 30 vessels owned by the 16 limited access DAS vessel owners in the limited access DAS vessel owner sample, two-thirds (66.7% or 20/30) were owned individually or by a pair of spouses (sole/spousal), 27% (8/30) were owned jointly by family members (type 2), and 6% (2/30) were owned jointly by non-family members (type 3).

⁴³ While further examination of the data to calculate the percentage of cases of spousal ownership would be worthwhile (as would calculation of the percentage of cases in which corporations were formed to own vessels), our interest here was in determining the percentages of sole/spousal ownership, joint family ownership (where family signifies non-spouse family members), and joint non-family ownership.

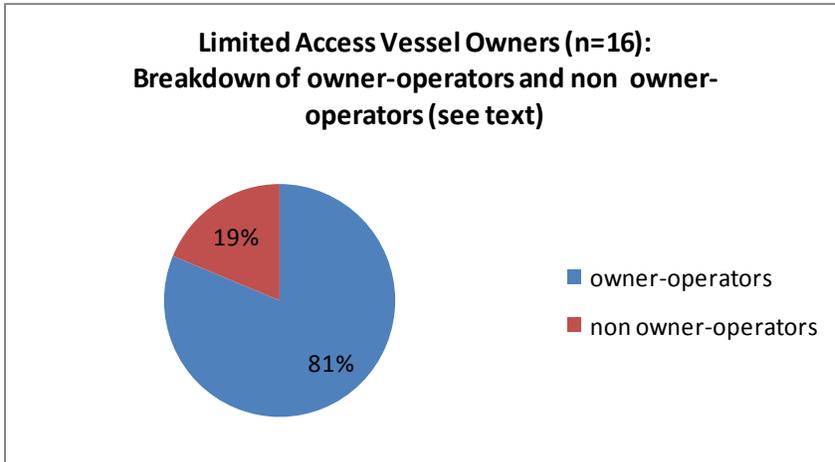


As previously indicated, the data collected do not, unfortunately, allow a determination of the total number of individual persons with ownership interests in the 30 vessels in which the 16 limited access DAS vessel owner had ownership interests. However, the data do indicate that: (a) as shown, two-thirds of the vessels (20/30) were individually owned (not counting spouses) and one-third of the vessels (10/30) were jointly owned (not counting spousal owners, i.e., in ownership types 2 and 3 above); (b) in the one-third of the vessels in joint ownership (types 2 and 3), the number of owners per vessel was small (approximately 2- 4 persons); and, finally, (c) some vessels jointly owned had the same joint owners as other vessels jointly owned (i.e., some limited access DAS vessel owners in the sample owned multiple vessels with the same group of co-owners). Finally, on another point, in only one case of joint ownership was one of the joint owners a silent-investor owner (this investor-owner was a partner of one of the 16 owners in the sample, and so was not in the sample).

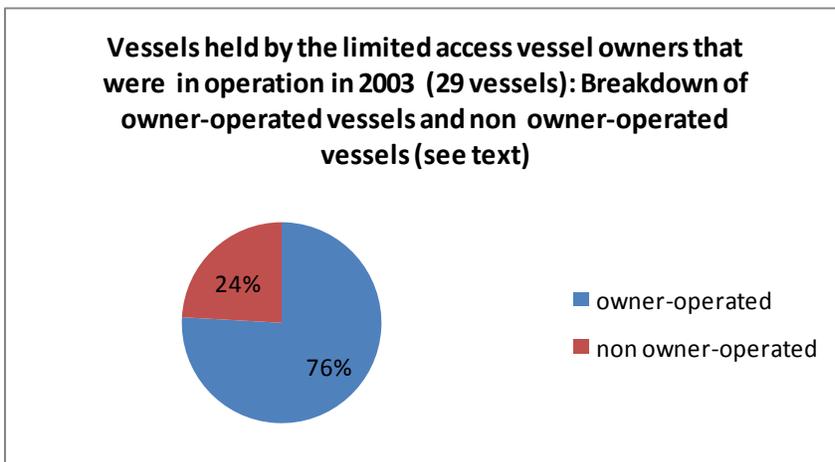
Owner-operators and non-owner-operators in 2003: All 16 of the limited access DAS vessel owners in the sample had vessels in operation in fishing year 2003; among them, they had 29 vessels in operation in 2003. (The one vessel not in operation in fishing year 2003 was owned by one of the vessel owners with multiple vessels; it was newly acquired by this owner at the end of fishing year 2003, and was not put into operation until fishing year 2004.) Eighty-one percent (81%, or 13/16) of the limited access DAS vessel owners were operating their own vessel, or, if they owned multiple vessels, operating *at least one of their own vessels* in 2003.⁴⁴ Nineteen percent (19%), or 3/16, did not operate their vessel, or if they owned multiple vessels, did not operate *any* of their vessels in 2003.

The 19% that did not operate any of their vessels used hired captains to operate their vessels; of this 19%, however, two-thirds (or 12.5% overall) hired captains who were family members (sons, cousins, nephews), while one-third (or 6% overall) hired captains who were not family members.

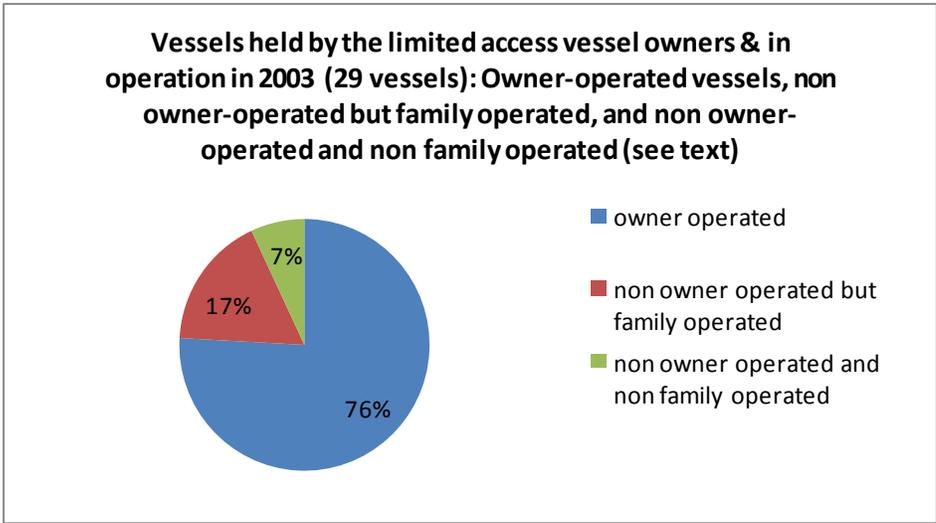
⁴⁴ Some vessel owners with multiple vessels operated *all* of their vessels, others operated one or more but not all of their vessels, and others operated none of their vessels. Vessel owners are counted as owner-operators if they operated at least one vessel at least some of the time.



Of the 29 vessels in operation in 2003, 22, or 76%, were owner-operated; this includes the vessels operated by the limited access DAS vessel owners in the sample as well as vessels not operated by the limited access DAS vessel owners in the sample but by other, co-owners of the vessels (i.e., for jointly owned vessels).

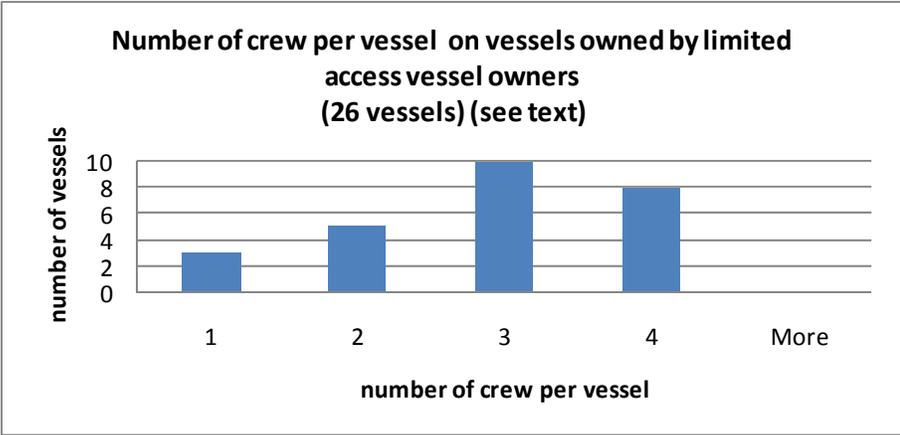


Of the 24% of vessels that were *not* owner-operated, however, almost three-quarters (71%), or 17% of the vessels overall, were captained (operated) by non-owners who were members of the owner's family (sons, nephews, cousins); slightly over a quarter (29%) of the vessels not owner-operated, or 7% of the vessels overall, were captained by non-owners who were *not* members of the owner's family. Thus, of the 29 vessels owned by the 16 limited access vessel members and in operation in 2003, only 7% (2 vessels) were captained by someone who was neither an owner of the vessel nor a member of the family of an owner of the vessel.

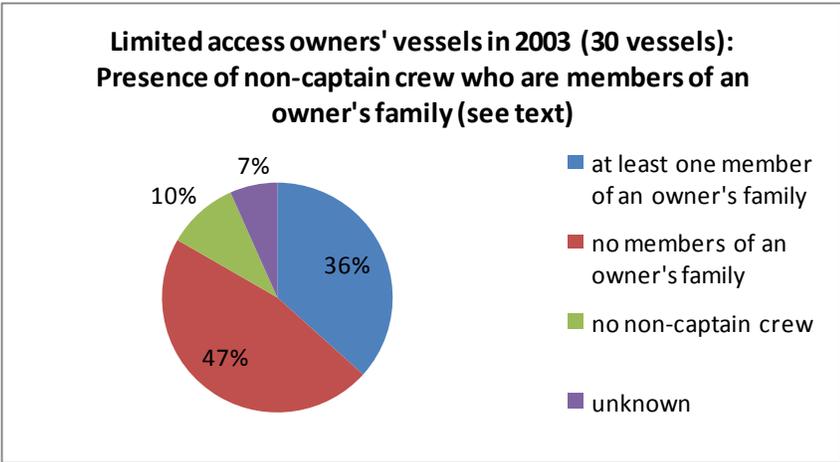


Finally, each of the vessel owners in the sample who did not operate their own vessels (both those who operated none of their own vessels and those who operated some but not all of their vessels) remained involved, from shore, in the operation of the vessels. Some were active shore captains, managing the vessel(s) and the business from shore; some had captained their vessel(s) in the past but had relinquished the captain’s chair (not, however, the ownership of the vessel) to a family member (e.g., a son); and some were busy captaining other vessels they owned while keeping an eye on the vessel they owned that was captained by another. Even the one vessel owner in the sample whose commercial fishing business was an adjunct to the shoreside businesses that he owned and ran (one of which was, notably, a shoreside support business for commercial fishing) – a vessel owner who was not an owner operator but one who hired captains – was involved in the operation of his vessel, both in the shoreside decisions required to run the vessel and, occasionally, on the vessel itself.

Number of crew per vessel in 2003: In 2003, the limited access DAS vessel owners operated their vessels with one to four crew members, including the captain; this calculation is based on 26 of the 30 vessels owned and/or fished by the limited access DAS vessel owners and in operation in 2003, as information was not available for the four other vessels in operation in 2003. The vessels for which the data were available were all vessels that targeted groundfish species (see the ‘species’ discussion below). The median was 3 crew members, and the mean 2.9 crew members. The distribution of the number of crew members per vessel is shown below:



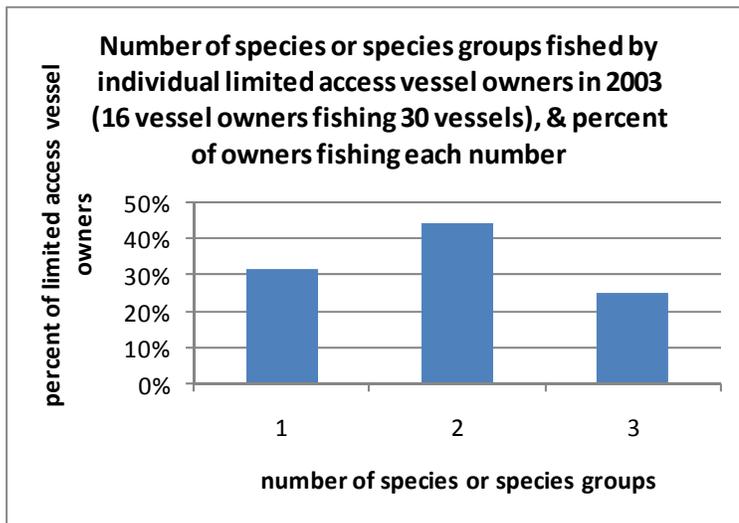
Non-captain crew members who are members of an owner’s family: Thirty-six percent (36%) of the vessels had at least one non-captain crew member who was a member of the owner’s family (a brother, son, father, uncle, brother-in-law, cousin, or godfather). Forty-seven percent (47%) had no non-captain crew who were members of the owner’s family; 10% had no non-captain crew at all (they were fished by the captain alone); and for 7% of vessels (2 vessels) it was unclear whether non-captain crew included family members. Notably, of the vessels that had no non-captain crew who were family members of the owner, 14% (7% of the vessels overall) had as crew persons who were themselves members of a family (a father and a son, and previously also the father’s brother), but not the owner’s family.



d. Fishing and mobility practices in 2003

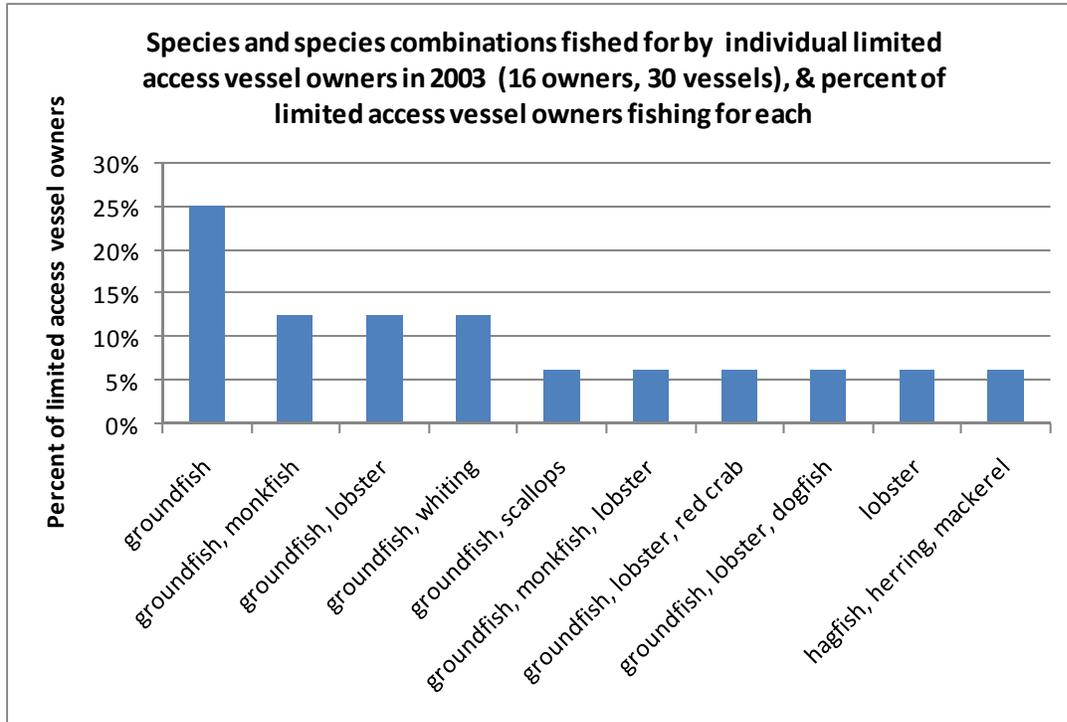
Fishing in 2003: All 16 limited access DAS vessel owners fished (or had others fish) their vessels in 2003. One vessel owner, who owned multiple vessels, did not fish one of his vessels in 2003 (as he newly acquired it in 2003). Hence, of the limited access DAS vessel owners' 30 vessels, 29 were fished in 2003. Further, one limited access DAS vessel owner in the sample fished, in addition to his own vessel, a vessel owned by another owner (not in the sample). Hence, the total number of vessels that the 16 limited access DAS vessel owners in the sample fished (or had others fish) in 2003 was 30. Of the 30 vessels fished in 2003, 28 had limited access DAS groundfish permits and two did not have groundfish permits at all. The two without groundfish permits were: (1) one of the vessels owned by one of the limited access DAS vessel owners in the sample, and (2) the vessel fished but not owned by one of the limited access DAS vessel owners in the sample.

Species fished for in 2003: In 2003, the 16 limited access DAS vessel owners, among them, fished for (i.e., targeted) 10 different species or species groups. These were: groundfish, lobster, monkfish, whiting, herring, mackerel, hagfish, red crab, dogfish, and scallop. Each limited access DAS vessel owner fished for 1-3 species or species groups in 2003: 31% fished for one species or species group, 44% fished for two species or species group, and 25% fished for three species or species groups. Note that these figures take into account *all* vessels owned and/or fished by each limited access DAS vessel owner; in some cases, an owner with multiple vessels fished each vessel for the same species or group of species while in others an owner fished different vessels for different species.

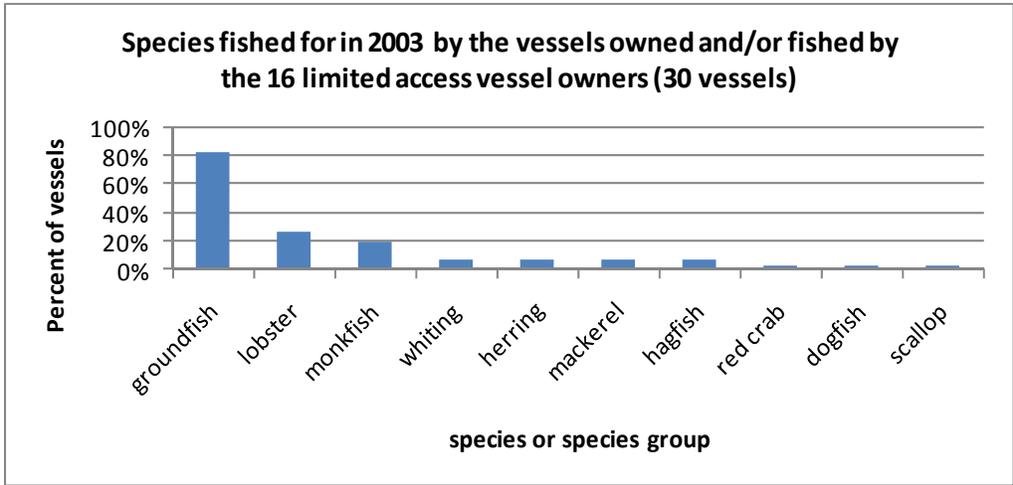


The limited access DAS vessel owners' individual strategies in 2003 – the species or species combinations for which each owner fished in 2003 – are shown below. As shown, not all the limited access DAS vessel owners were fishing for groundfish in 2003; 88% were fishing for groundfish, but 12% were not. The 12% not

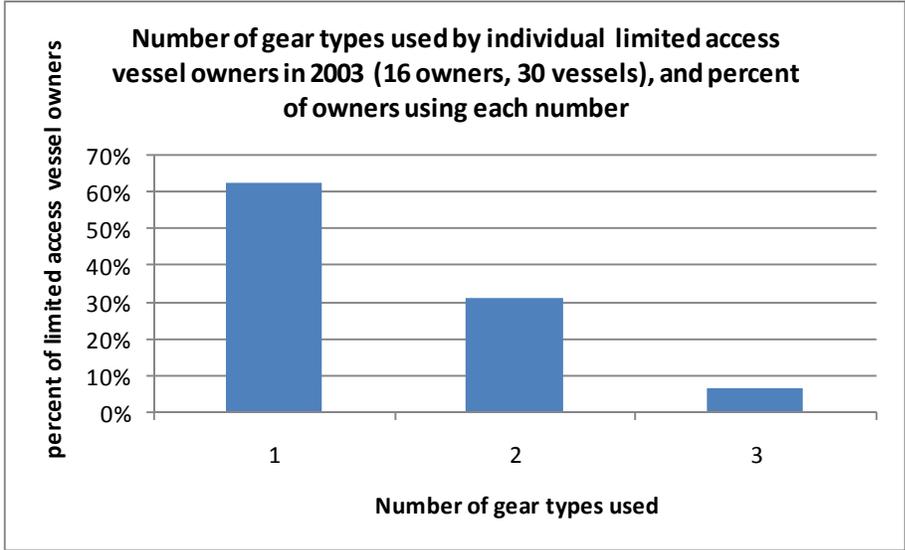
fishing for groundfish were fishing for lobster, or for hagfish, herring, and mackerel. Of the 88% fishing for groundfish, 28% (or 25% overall) were fishing *exclusively* for groundfish, while 71% (63% overall) were fishing for groundfish and one or two other species.



The following chart breaks down individual species and species groups caught by the limited access DAS vessel owners by the total numbers (expressed as percents) of owners' vessels (vessels owned or fished by the owners) catching the species. As shown, 83% of the owners' vessels fished for groundfish species, 27% for lobster, 20% for monkfish, 7% for whiting, 7% for herring, 7% for mackerel, 7% for hagfish, 3% for red crab, 3% for dogfish, and 3% for scallops. (As some vessels fished for multiple species –see above – the total sums to greater than 100%.)

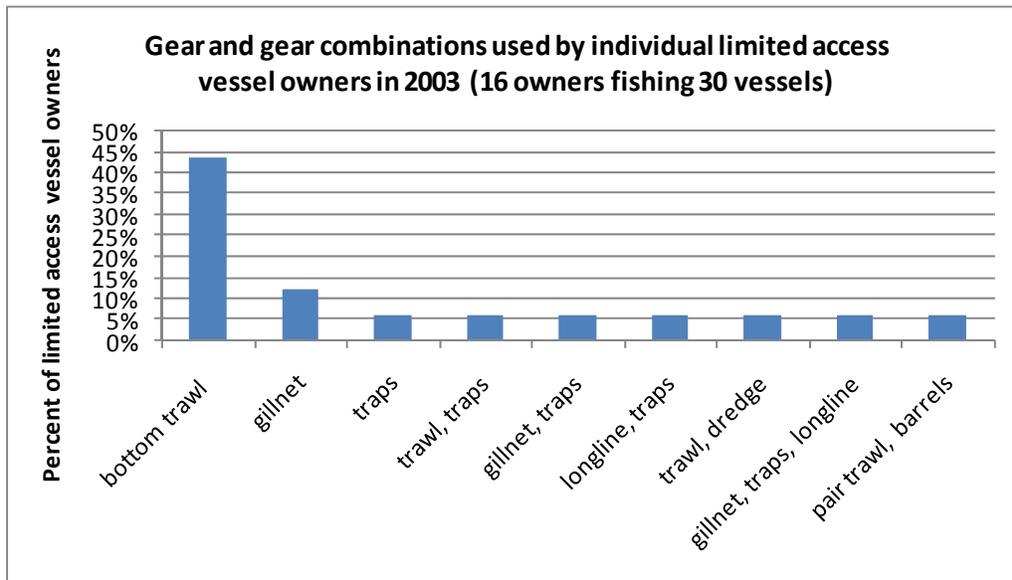


Gears used in 2003: The 16 limited access DAS vessel owners fishing in 2003 used, among them, seven gear types: bottom trawl, gillnet, traps, longline, pair trawl, barrels, and scallop dredge. Each limited access DAS vessel owner used 1-3 gear types in 2003. Sixty-three percent (63%) used just one gear type (across all vessels owned), 31% used two gear types (across all vessels owned), and 6% used three gear types (across all vessels owned). Note that owners using multiple gears either switched among gears on a single vessel (switching gear types as they switched target species) or used different gears on different vessels (using one vessel to target one species or species group and another vessel to target another species or species group).

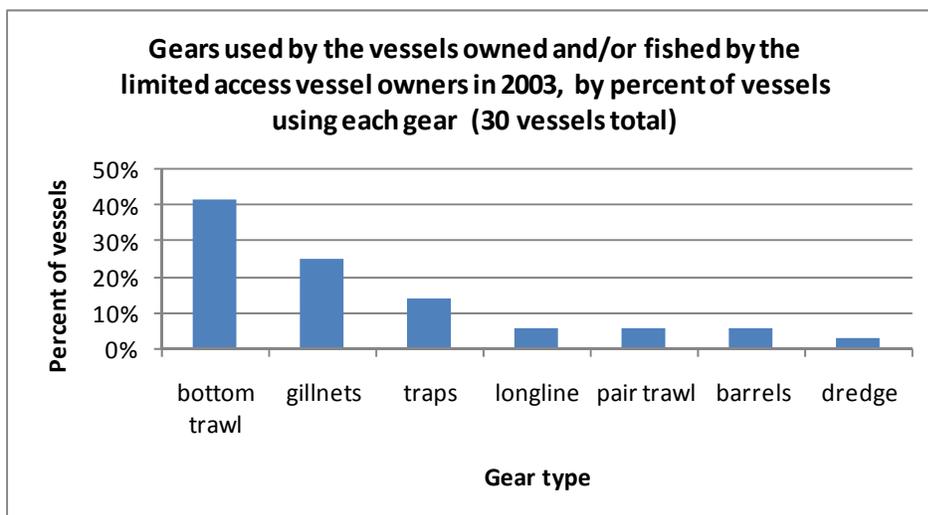


The gears or combinations of gears used by the individual limited access DAS vessel owners (across all vessels owned by an individual owner) are shown below. As shown there, 44% of the owners used bottom trawl gear exclusively, 13% of the owners

used gillnets exclusively, 6% used traps exclusively, and 38% used some combination of gears (32% combining two gear types and 6% combining three gear types).



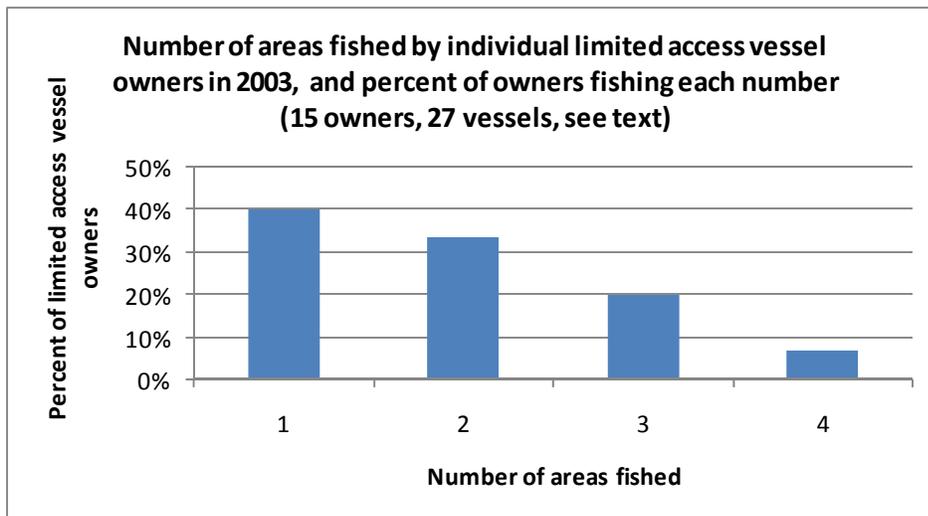
The following chart, finally, breaks down gear type by vessel rather than by vessel owner; it shows the numbers of vessels (expressed as percents of vessels) owned or fished by the owners fishing each gear type. (As some vessels used multiple gear types - see above, the percents total to greater than 100%). As shown, 42% of the vessels owned and/or fished by the owners used bottom trawl, 25% used gillnets, 14% used traps, 6% used pair trawls, 6% used barrels, and 3% used a dredge.



Areas fished in 2003: The limited access DAS vessel owners fished, in 2003, in five general areas of ocean. (This analysis is based on information from 15 of the 16 limited access DAS vessel owners, and from 27 of the 30 vessels they owned and/or fished.⁴⁵) The five general areas were:

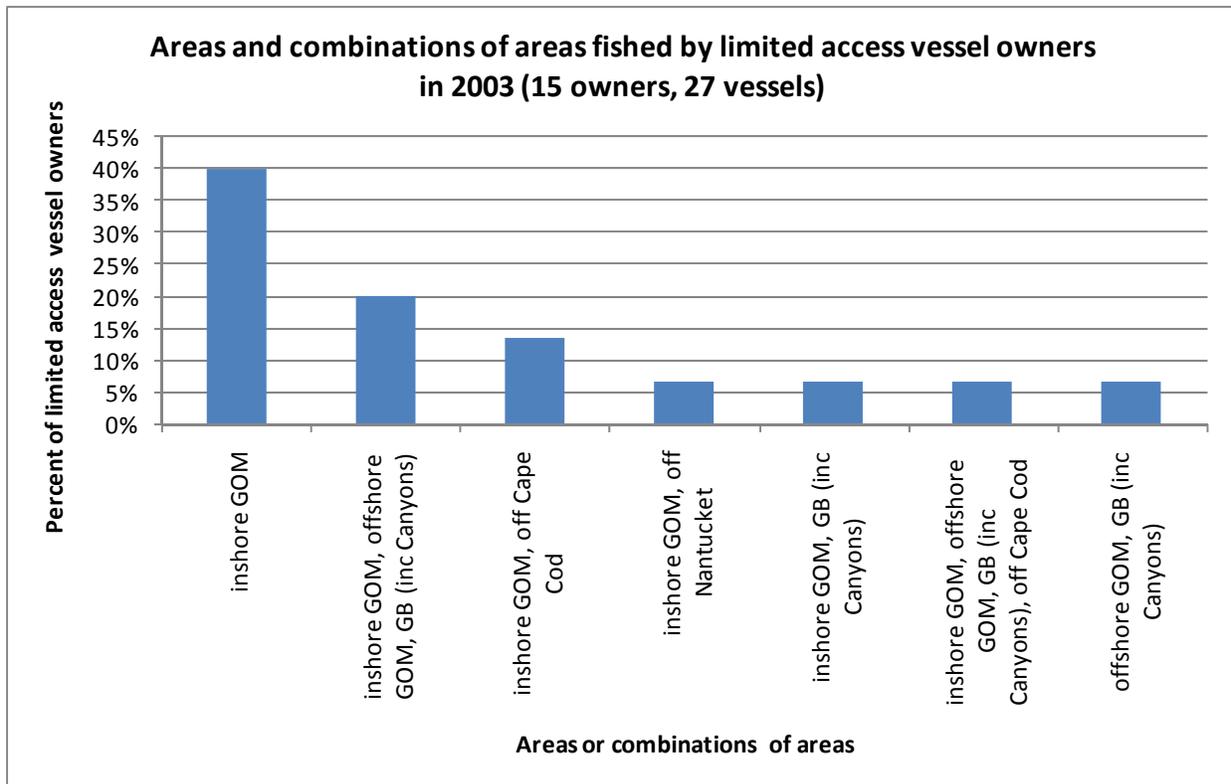
- inshore Gulf of Maine (GOM), including, but not limited to: Massachusetts Bay, Ipswich Bay, Stellwagen Bank, Jefferys Ledge;
- offshore Gulf of Maine (GOM), including, but not limited to: Cashes Ledge, Jeffreys Bank, Platts Bank, Fippennies Ledge, Wilkinson Basin, and Rodgers Swell;
- on and around Georges Bank (GB), including, but not limited to, Franklin Basin, the Southeast Parts, Cultivator Shoals, and the Canyons;
- off Cape Cod (“the Outer Cape”); and
- off Nantucket.

Each individual owner fished, across all vessels owned and/or fished, 1-4 areas in 2003. Owners with multiple vessels fishing in multiple areas fished either each vessel in each area or different vessels in different areas. As shown below, 40% of the owners fished in just one area, 33% of the owners fished in two areas, 20% of the owners fished in three areas, and 7% of the owners fished in four areas.

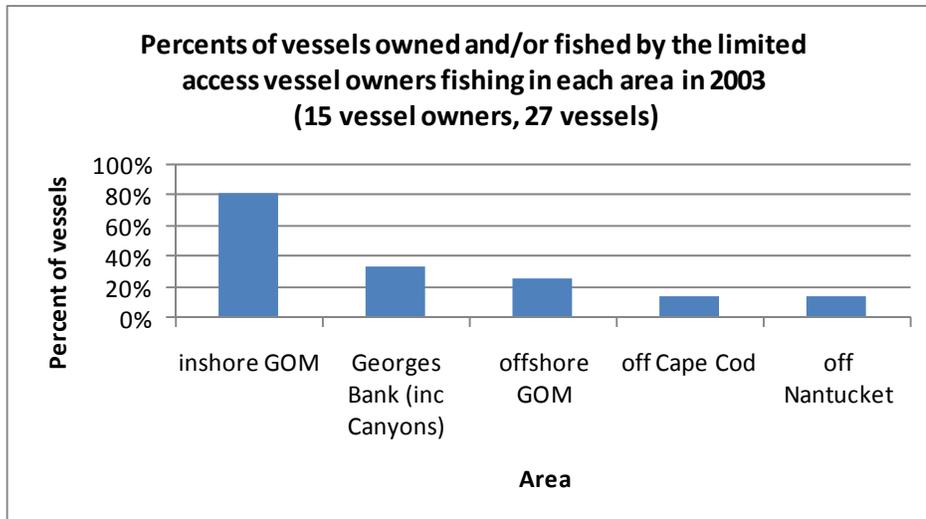


⁴⁵ Information about areas fished in 2003 was lacking for one of the 16 vessel owners (a vessel owner who fished two vessels in 2003) and it was also lacking for one of two vessels fished by another vessel owner.

The areas or combinations of areas fished by individual limited access DAS vessel owners are shown below. As shown, 40% of the limited access DAS vessel owners fished exclusively in the inshore Gulf of Maine; 20% fished in the inshore Gulf of Maine and either off Cape Cod or off Nantucket (13% off Cape Cod and 7% off Nantucket); 20% fished in the inshore Gulf of Maine, the offshore Gulf of Maine, and Georges Bank (including the Canyons); 14% fished either inshore or offshore in the Gulf of Maine and on and around Georges Bank (including the Canyons) (7% in the inshore GOM and 7% in the offshore GOM); and 7% fished inshore and offshore in the Gulf of Maine, on and around Georges Bank (including the Canyons), and off Cape Cod.



Finally, the following chart breaks down areas fished by the number of vessels (expressed as percent of vessels) fishing in each area in 2003. This analysis of areas is not, like the two above, by vessel owner (i.e., fishing business) but by vessel. It shows the numbers (as percents) of the owners' vessels (vessels owned and/or fished by the owners) fishing in each area. As some owners' vessels fished in multiple areas in 2003, the percents do not sum to 100%. As shown below, 81% of the vessels fished in the inshore Gulf of Maine, 33% of the vessels fished on or around Georges Bank (including the Canyons), 26% of the vessels fished offshore in the Gulf of Maine, 15% of the vessels fished off Cape Cod, and 15% of the vessels fished off Nantucket.



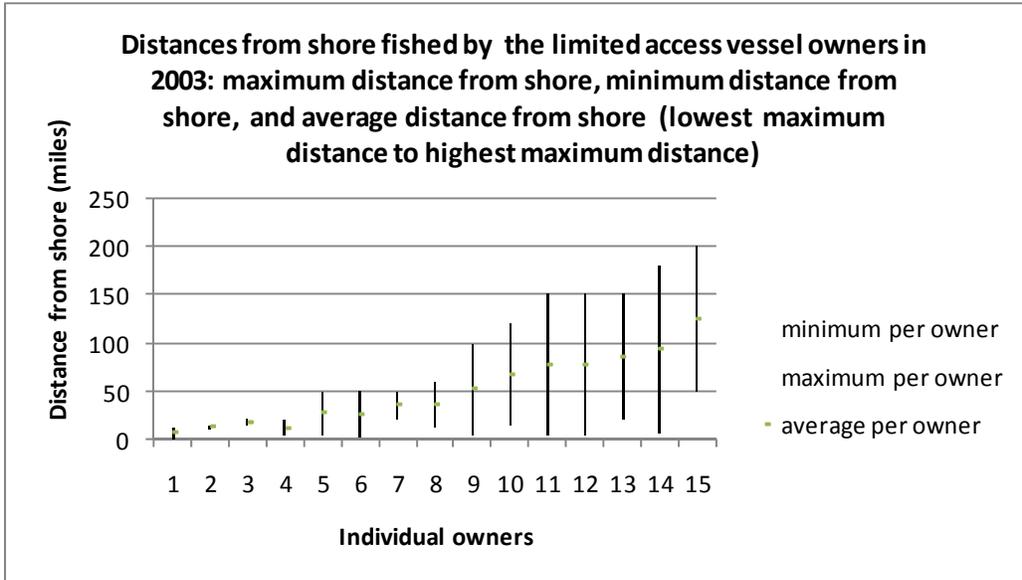
Distances from shore in 2003: Individual limited access DAS vessel owners fished from 0 – 200 miles from shore in 2003. (This analysis is based on information from 15 of the 16 limited access DAS vessel owners, and from 27 of the 30 vessels they owned and/or fished.⁴⁶) The mean of the individual owners' *minimum* distances from shore was 11 miles from shore, while the median of the minimum distances was 6 miles from shore. The mean of the individual owners' *maximum* distances from shore was 89 miles from shore, while the median of the maximum distances was 60 miles from shore. The mean of their ranges (maximum distances minus minimum distances) was 77 miles, while the median was 48 miles. Note that these figures take into account *all* vessels owned and/or fished by each limited access DAS vessel owner; owners with multiple vessels either fished their multiple vessels the same maximum and minimum distances from shore, or fished different vessels different minimum and maximum distances from shore. The figures are summarized below:

Limited access DAS vessel owners' Distances from Shore in 2003 (miles)

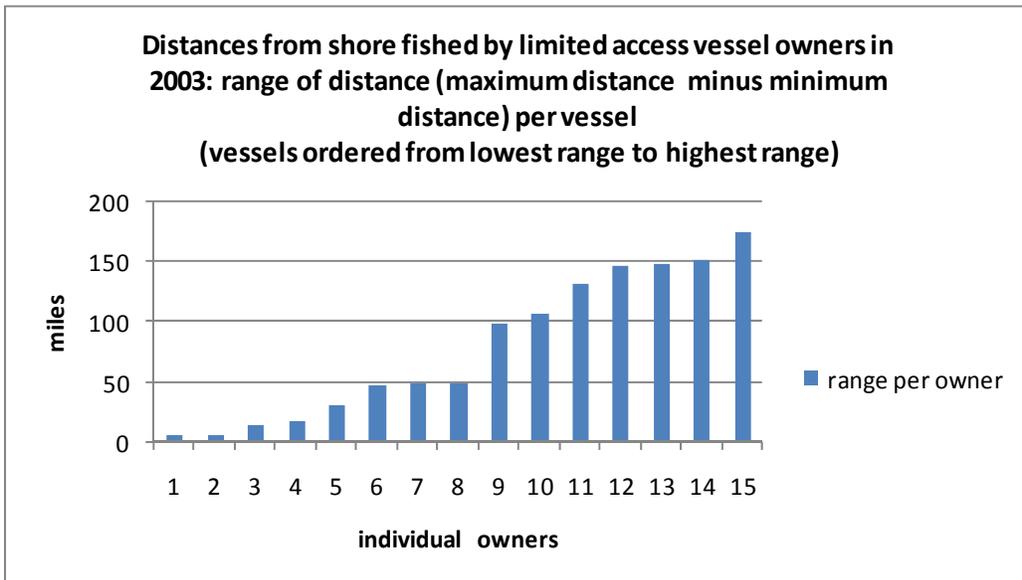
	minimum distance from shore	maximum distance from shore	range (maximum distance minus minimum distance)
mean	11	89	77
median	6	60	48
range	50	187	169
minimum	0	13	5
maximum	50	200	174

⁴⁶ Information about distances from shore in 2003 was lacking for one of the 16 vessel owners (a vessel owner who fished two vessels in 2003) and it was also lacking for one of two vessels fished by another vessel owner.

The owners' individual minimums and maximums (and averages) are indicated below:



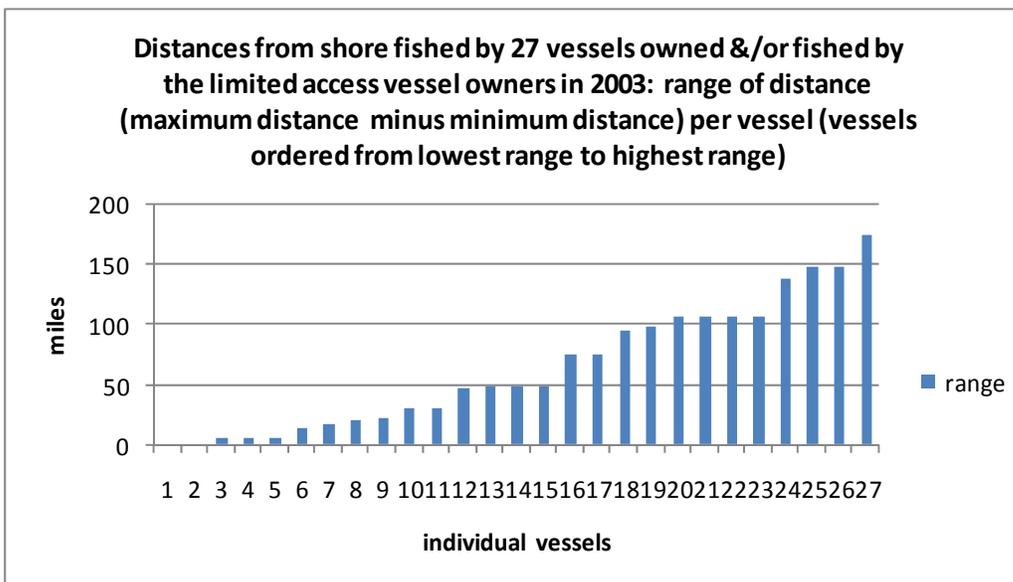
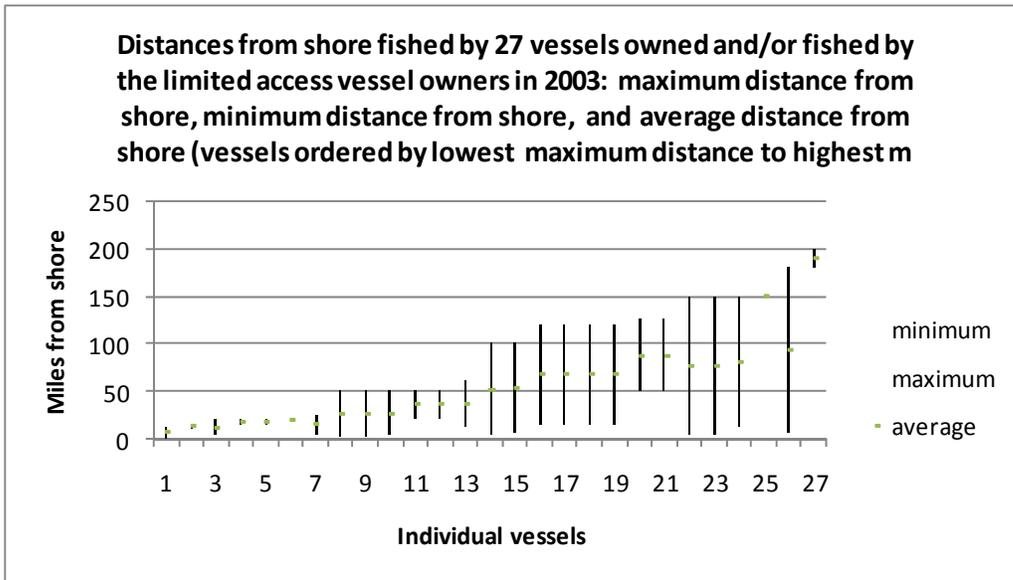
The owners' ranges (maximum distances minus minimum distances) are indicated below:



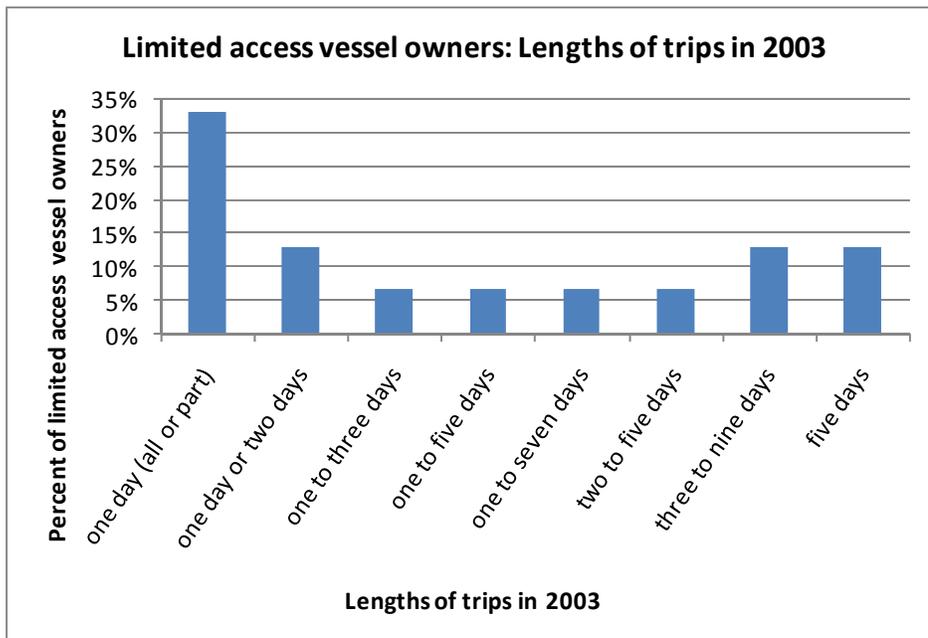
The following tables and charts analyze distances from shore fished by individual vessels rather than, as above, by individual vessel owners:

Limited Access Owners' VESSELS' Distances from Shore in 2003 (miles)

	minimum distance from shore	maximum distance from shore	range (maximum distance minus minimum distance)
mean	24	87	63
median	12	100	48
range	180	187	174
minimum	0	13	0
maximum	180	200	174



Trip lengths in 2003: The limited access DAS vessel owners' fishing trips varied in length from one day (or part of one day) to nine days in 2003. (This analysis is based on information from 15 of the 16 limited access DAS vessel owners, and from 27 of the 30 vessels they owned and/or fished.⁴⁷) One-third (33%) of the owners took exclusively day trips (part or all of a single day) in 2003; 13% took trips that were either one or two days; and 7% took trips that ranged in length from one day to three days; hence, 53% of the owners took trips ranging from one day (or part of a day) to three days in 2003. Thirty-four percent (34%) of the owners varied widely in the lengths of the trips taken by their vessels (vessels they fished and/or owned): 7% took trips anywhere from one to five days long; 7% took trips anywhere from one to seven days long; 7% took trips from two to five days long; and 13% took trips from three days long to nine days long. Finally, the remaining 13% took trips that were five days long.

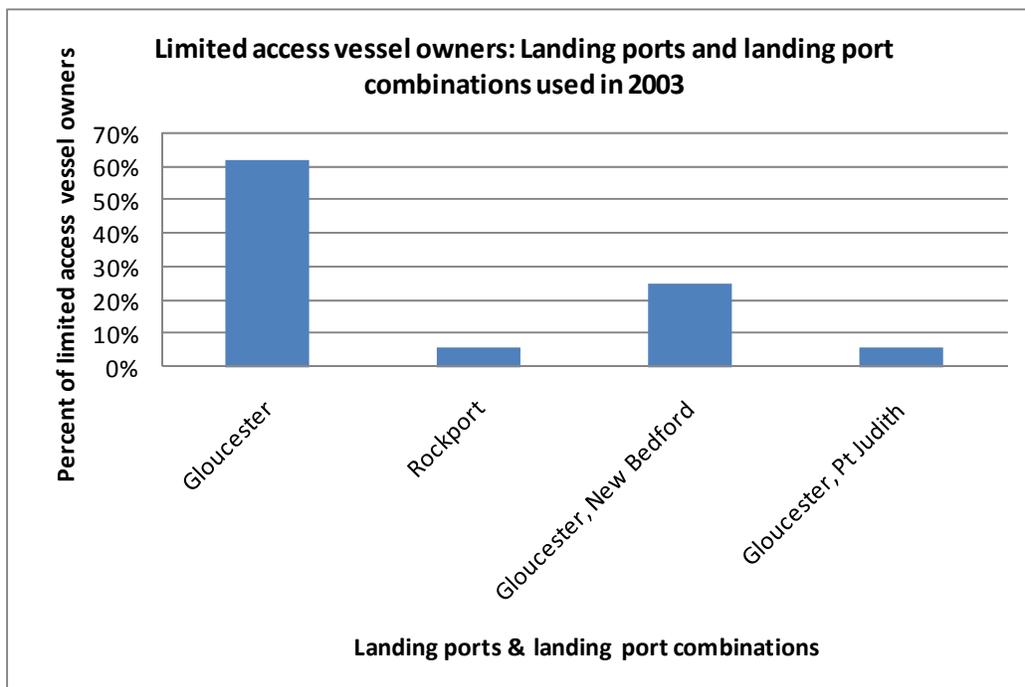


As with other owner by owner analyses above, this owner trip length analysis takes into account *all* vessels owned and/or fished by each limited access DAS vessel owner. Owners with multiple vessels either fished their multiple vessels for the same lengths of time (or same ranges of lengths) or fished different vessels different lengths (or ranges of lengths) of time.

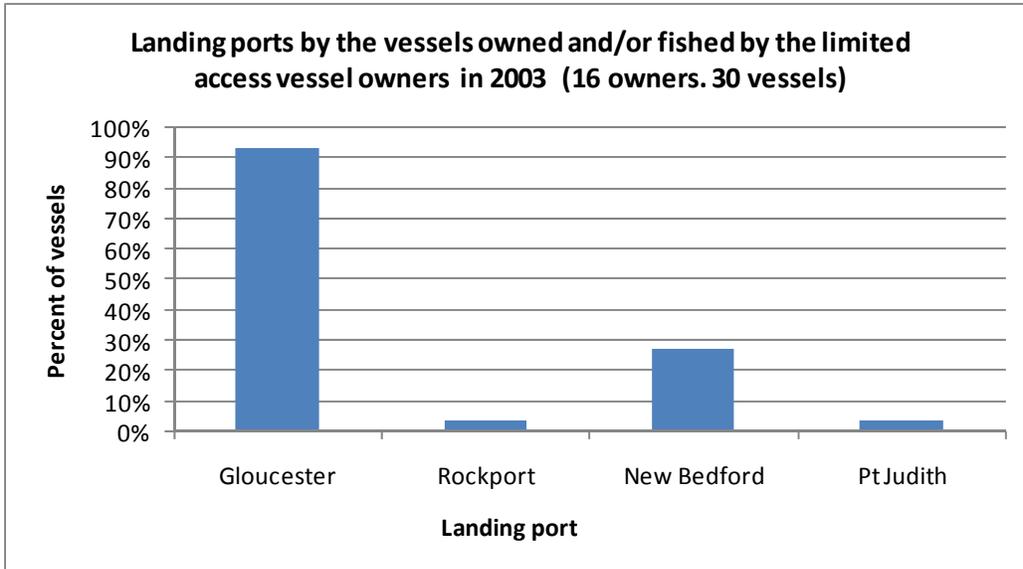
⁴⁷ Information about distances from shore in 2003 was lacking for one of the 16 vessel owners (a vessel owner who fished two vessels in 2003) and it was also lacking for one of two vessels fished by another vessel owner.

Ports used in 2003: The limited access DAS vessel owners were asked about the ports they used in 2003 to: (1) land fish (where fish is unloaded from the vessel), (2) sell fish (where the first ex-vessel sale takes place), and (3) tie up their vessels.

Landing ports: The 16 limited access DAS vessel owners in the sample used, among them, four different landing ports in 2003: Gloucester, Rockport (MA); New Bedford (MA), and Pt Judith (RI). Sixty-nine percent (69%) of the owners used one landing port exclusively in 2003, while 39% used two landing ports in 2003. The ports and port combinations used by the limited access owners are indicated below. As shown, 63% landed their fish exclusively in Gloucester in 2003, and 6% landed their fish exclusively in Rockport, MA (located, with Gloucester, on Cape Ann, Massachusetts); these owners, together, comprised the 69% whose vessels (those they owned and/or fished) landed fish exclusively in one port in 2003. The remaining 31% landed fish in two ports in 2003: 25% landed fish in Gloucester and New Bedford, and 6% landed fish in Gloucester and Pt Judith. Owners with multiple vessels using two ports landed their multiple vessels in the same two ports or landed different vessels in different ports.



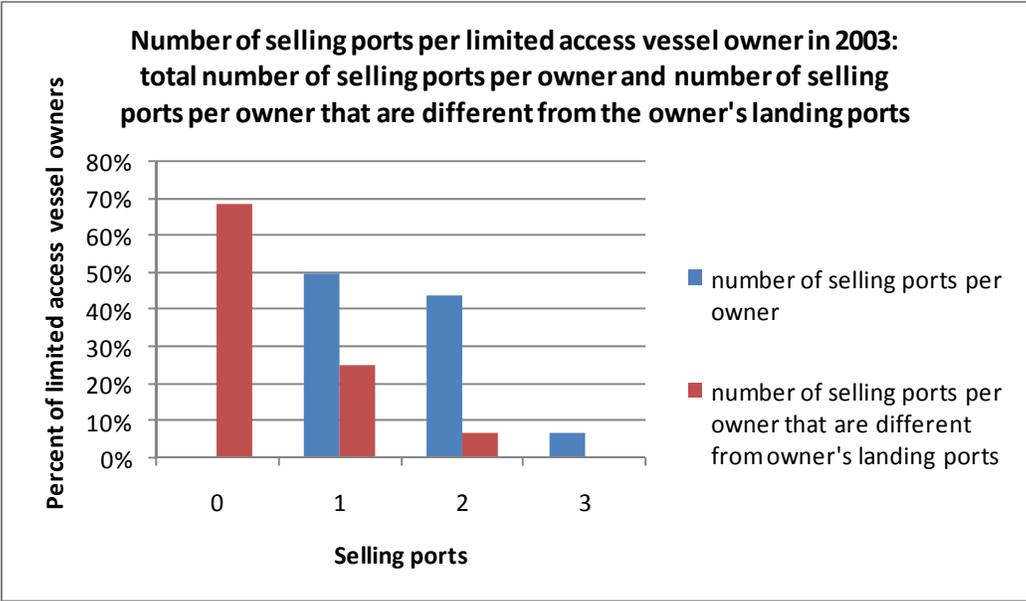
The following chart examines landing port use by vessel rather than by owner: It shows that 93% of the vessels owned and/or fished by the limited access DAS vessel owners landed fish in Gloucester, 25% landed fish in New Bedford, 6% landed fish in Rockport, and 6% landed fish in Pt Judith. (As some vessels landed fish in more than one port, the percents sum to greater than 100%.)



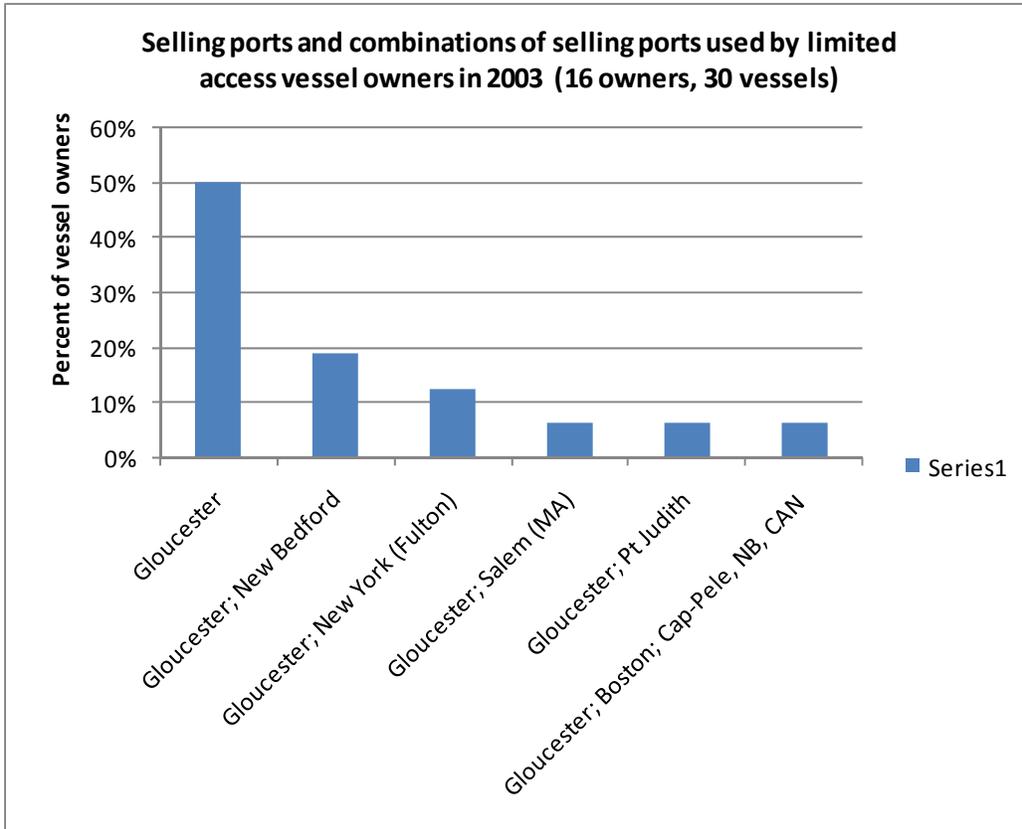
Selling ports: The 16 limited access DAS vessel owners used, among them, seven different selling ports in 2003. Selling ports were defined as ports in which the first ex-vessel sale of the fish is made; selling ports may be – and often are – the same as landing ports, but, in some cases, they differ. In cases in which selling ports do differ from landing ports, fish is trucked from landing port to selling port. Trucking arrangements take a variety of forms; in some cases, the seller (the vessel owner/ fishing business) arranges for – and pays for – the trucking, while in others the buyer (the fish dealer) arranges for – and pays for – the trucking.

The seven selling ports used in 2003 included three of the four landing ports, and four ports (or locales) not used as landing ports. The three selling ports that were also landing ports were: Gloucester, New Bedford, and Pt Judith. The four selling ports that were *not* also landing ports were: Boston, New York (Fulton Fish Market), Salem (MA), and Cap-Pele, New Brunswick, Canada.

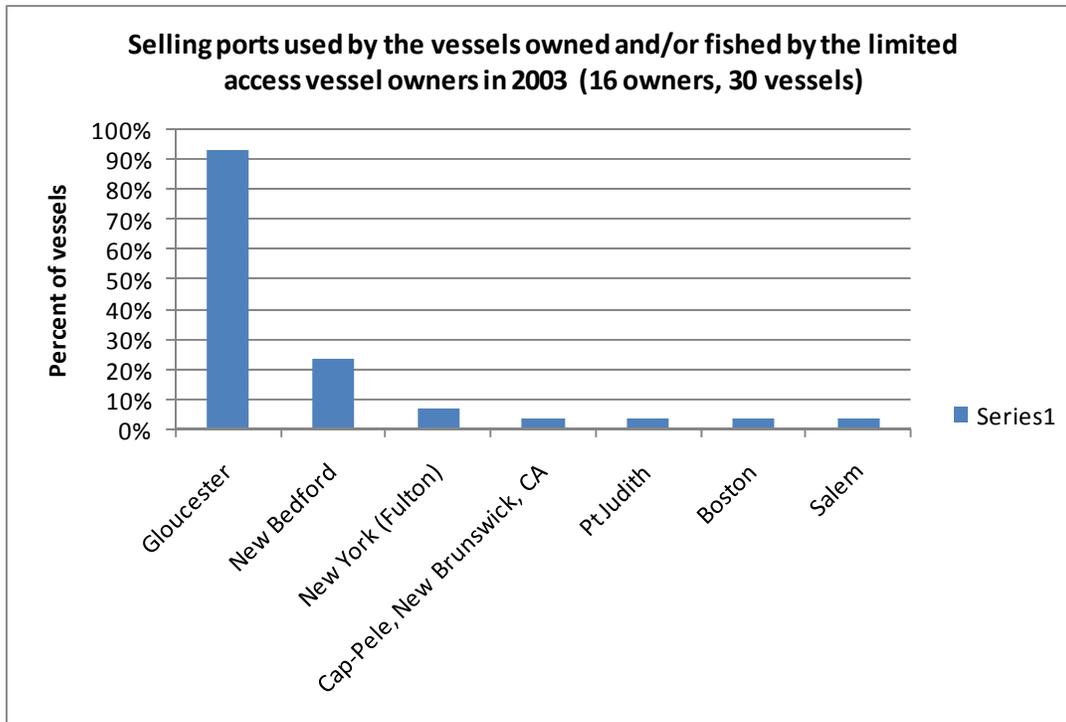
Individual limited access DAS vessel owners used one to three selling ports in 2003. Fifty percent (50%) used just one selling port; 44% used two selling ports; and 6% used three selling ports. Sixty-nine percent (69%) of the owners used selling ports that were the same as their landing port(s), while 31% used at least one selling port different from their landing port(s) (25% used one selling port that was different from their landing port(s), and 6% used two selling ports that were different from their landing port(s)). The 31% of owners using selling ports different from landing ports used, as indicated: Boston, New York (Fulton Fish Market), Salem (MA), and Cap-Pele, New Brunswick, Canada. The number of selling ports per owner, and the number of selling ports per owner that were different from the owner’s landing ports, are indicated below:



As in the other owner analyses, the owner selling port analyses take into account all vessels owned and/or fished by individual owners in 2003. Owners with multiple vessels used the same selling ports for their multiple vessels or different selling ports for different vessels. The selling ports and combinations of selling ports used by individual owners for their vessel(s) in 2003 are shown below: As shown, 50% of the owners used Gloucester, exclusively, as their selling port in 2003 (these are the same 50% who used only one selling port in 2003). Nineteen percent (19%) used Gloucester and New Bedford; 13% used Gloucester and New York (Fulton Fish Market); 6% used Gloucester and Salem (MA); 6% used Gloucester and Pt Judith (RI); and 6% used Gloucester, Boston, and Cap-Pele, New Brunswick, Canada.



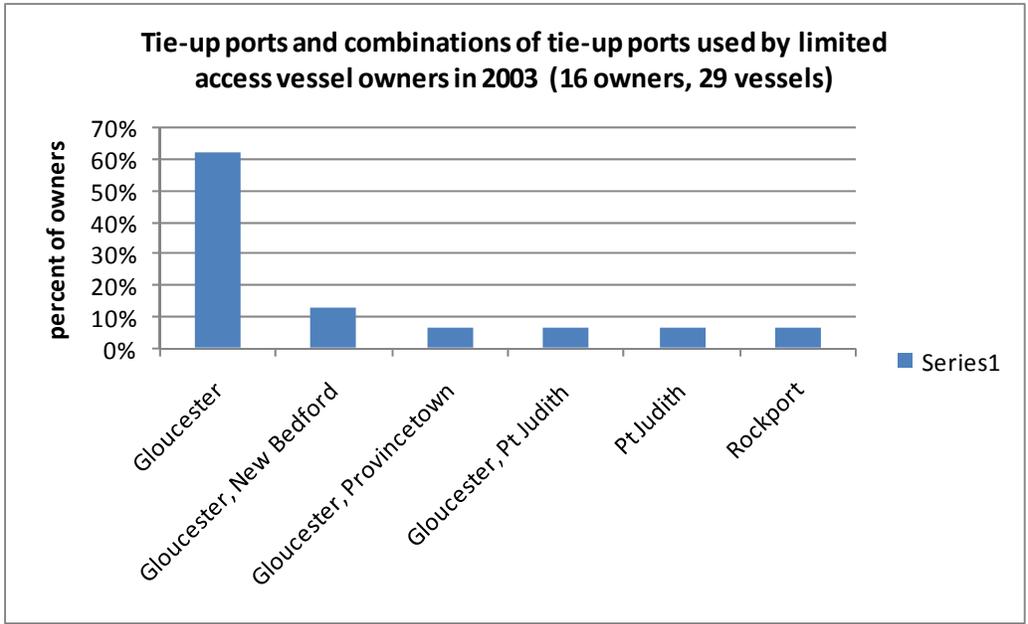
Finally, the use of selling ports by *vessel*, rather than by owner, is shown below: As shown, 93% of the owners' vessels (vessels owned and/or fished by the owners in 2003) used Gloucester as a selling port; 23% used New Bedford as a selling port; 7% used New York (Fulton Fish Market), and 3% used, respectively, Cap-Pele, New Brunswick, Canada; Pt Judith (RI), Boston, and Salem (MA). (As some vessels used more than one selling port –see above – the percents sum to more than 100%.)



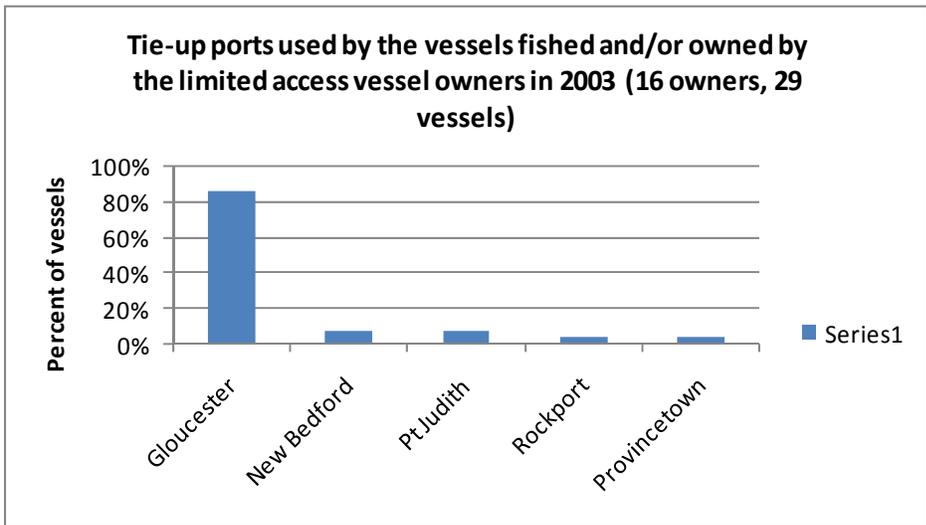
In all, 17% of the owners' vessels used selling ports that were different from their landing ports (the vessels using New York (Fulton), Salem (MA), Boston, and Cap-Pele, New Brunswick, Canada). That the vessels using these latter four selling ports did not overlap (i.e., the vessels using these selling ports can be added together without doublecounting vessels using selling ports that are different from landing ports) can be seen by an examination of the former chart showing owners' use of selling ports and combinations of selling ports; as shown, different owners (and, so, different vessels) used each of these four selling ports (the four that were different from landing ports).

Tie-up ports: The 16 limited access DAS vessel owners used, among them, five different tie-up ports in 2003: Gloucester, Rockport, New Bedford, Pt Judith, and Provincetown. (This analysis is based on information from all 16 of the limited access DAS vessel owners, but only 29 of the 30 vessels they owned and/or fished in 2003.⁴⁸) Each vessel owner used one or two tie-up ports during the year; seventy-five percent (75%) used one tie-up port, and 25% used two tie-up ports. The tie-up ports and combinations of tie-up ports used by the individual owners are shown below. As seen, 63% used Gloucester, 13% used Gloucester and New Bedford, 6% used Gloucester and Provincetown, 6% used Pt Judith, and 6% used Rockport (MA).

⁴⁸ Information about tie-up ports in 2003 was lacking for one of the vessels of one of the owners, an owner who had multiple vessels in 2003.



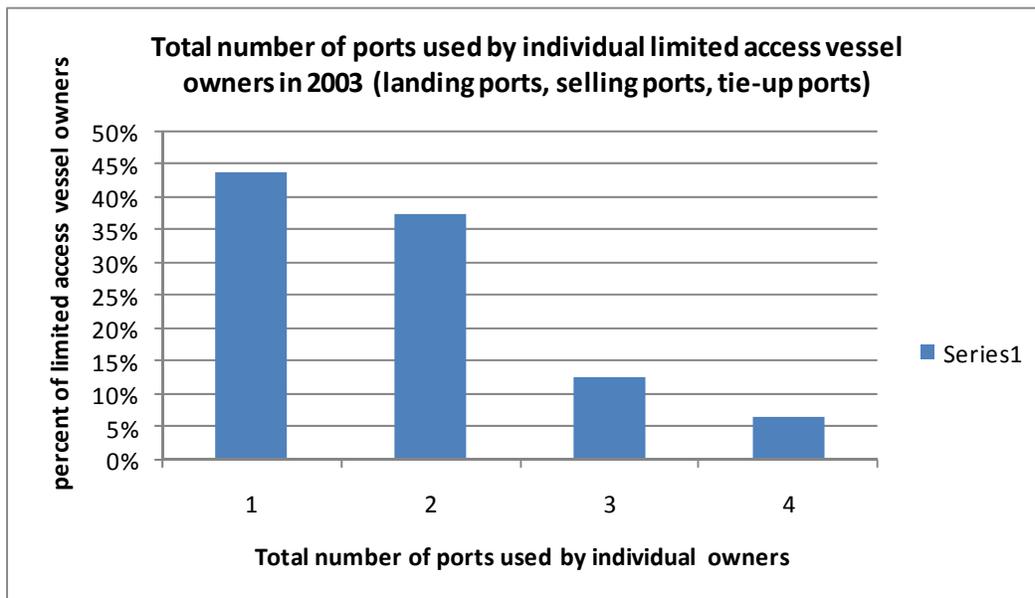
Finally, the use of tie-up ports by vessel, rather than by owner, is shown below. As shown, 86% of the owners' vessels (vessels owned and/or fished by the owners) used Gloucester, 7% used New Bedford, 7% used Pt. Judith, 3% used Rockport, and 3% used Provincetown. (As some vessels used more than one tie-up port –see above – the percents sum to more than 100%.)



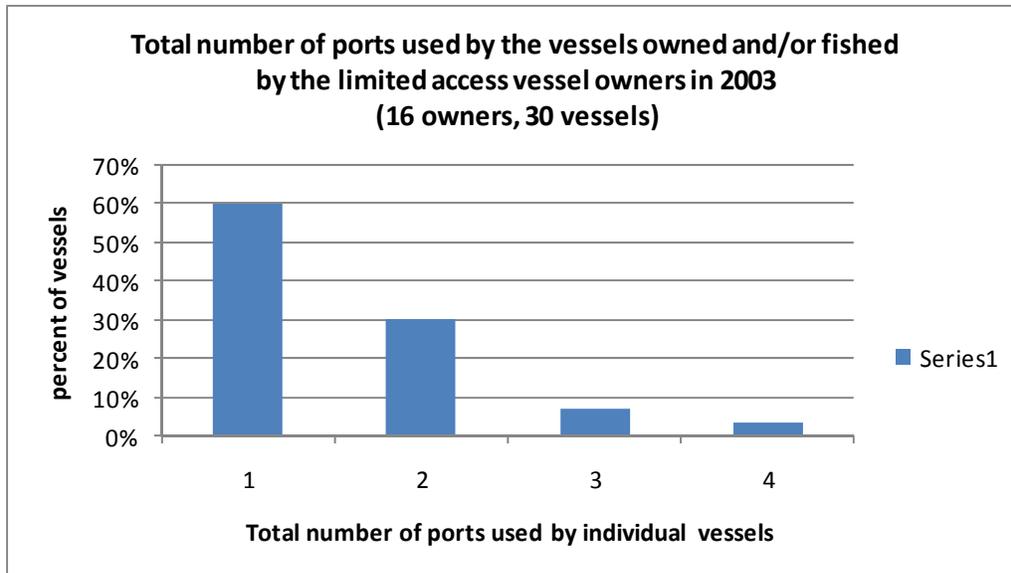
Landing ports, selling ports, and tie-up ports combined: An analysis was done of the total number of ports that were used by individual limited access DAS vessel owners in 2003 for landing fish, selling fish, and tying up vessels. This analysis simply counted the total number of unique ports used by each limited access DAS

vessel owner in 2003, whether for landing or selling fish or tying up a vessel. As with all individual owner analyses presented here, the analyses took into account all vessels owned and/or fished by the individual limited access DAS vessel owners.

In total, the limited access DAS vessel owners used nine ports for landing fish, selling fish, and tying up their vessels in 2003. (The ports, by now, will be familiar: Gloucester, New Bedford, Boston, Cap-Pele (NB, Canada), New York (Fulton Fish Market), Provincetown, Salem (MA), Rockport (MA), and Pt Judith.) Each individual limited access DAS vessel owner used one to four ports for landing fish, selling fish, and tying up vessels. As shown below, 44% of the owners used one port, 38% used 2 ports, 13% used 3 ports, and 6% used four ports.



The total number of ports used by individual vessels, rather than by individual owners, is shown below. As shown, 60% of the owners' vessels (vessels owned and/or fished by the owners) used only one port for landing fish, selling fish, and tie-up in 2003; 30% used two ports; 7% used 3 ports; and 3% used 4 ports.



Residence while fishing and ‘permanent’ residence: In addition to asking about ports used for landing fish, selling fish, and tying up boats, the project also asked about owners’ home residences (their ‘permanent’ residences) and about their residences while fishing. The data on places of home or permanent residence was presented in section 3(a).⁴⁹ In inquiring about residence while fishing, the project asked about places of residence when a vessel was tied up at dock *in between fishing trips* (not, that is, about residence while actually at sea, as this was understood to be – for owners with vessels fishing trips greater than one day – on board the fishing vessel). One hundred percent (100%) of the owners reported that their primary residence while fishing was at home. Thirteen percent (13%) reported a secondary residence while fishing (i.e., in between fishing trips); in both cases, the secondary residence was on board the owner’s vessel, while the vessel was tied up at dock. For 6% of owners, an owner’s vessel was at Provincetown, between trips, and for another 6% of owners, an owner’s vessel was at Gloucester, between trips, and the place of home residence was greater than sixty miles from Gloucester.

IV. Discussion

The data present a remarkably clear picture of New England groundfishing businesses operating from Gloucester in 2003, the year before the 10-year stock rebuilding plans, associated DAS reductions, and DAS transferability provisions went into effect in the New England groundfishery. As indicated, these data have been generated from the businesses with limited access DAS vessels, the businesses that

⁴⁹ The analysis showed that, in 2003, 63% of the limited access DAS vessel owners lived in Gloucester, 25% lived within 20 driving miles of Gloucester, 6% lived within 70 driving miles of Gloucester, and another 6% lived within 120 driving miles of Gloucester in 2003. See section (3)(a).

constitute the major part of the commercial groundfish fishery, and so describe only this sector – the principal commercial sector -- of the groundfish fishery in Gloucester.

Prior to summarizing the picture of this sector in Gloucester, several caveats need be reviewed. First, as was discussed in the methods section, the sampling frame from which the sample was drawn (the limited access DAS vessel subset of the Gloucester principal port list in 2003) likely excluded some groundfish businesses landing fish in Gloucester in fishing year 2003, in particular, those using the port only part of the year (as such businesses could be expected to have identified ports other than Gloucester as their vessels' principal ports). Indeed, analysis of the data from the sample suggests that a large majority of the businesses listing Gloucester as their vessels' principal port in 2003 were businesses with vessels for which Gloucester was not only "principal port" (the port where "the majority of your landings occur") but, also, homeport. Eighty-six percent (86%) of the vessels owned by the business owners used Gloucester as tie-up port in 2003 (some used an additional tie-up port as well). Further, 88% of the business owners lived in Gloucester or within 20 miles of Gloucester; one additional business owner (constituting another 6%) lived within 70 driving miles but used Gloucester as tie-up port and considered Gloucester his vessel's homeport. While this is an interesting finding – that principal port and homeport converge for the majority of the vessels owned by the business owners in the sample – it should not obscure the fact that the sampling frame likely excluded businesses with vessels that fish from Gloucester, or land fish in Gloucester, only part of the year. Hence, the sample should be understood to represent – and the data from the sample to describe – for the most part, the set of groundfishing businesses (with limited access DAS vessels) for which Gloucester, in 2003, was both principal port and homeport, and to exclude, for the most part, any groundfishing businesses (with limited access DAS vessels) using Gloucester part of the year, to fish from, and/or to land fish, as these businesses likely used ports other than Gloucester as principal port (and as homeport).

Second, as was also discussed in the methods section, the sample of business owners was biased – to an unknown degree – in favor of businesses owning multiple limited access DAS vessels. In addition, in a possibly related point, the limited access DAS vessels owned by the businesses in the sample (all with Gloucester as principal port in 2003) were larger, on average, than the full set of limited access DAS vessels with Gloucester as principal port in 2003. And, finally, the limited access DAS vessels owned by the business owners in the sample had a greater proportion of type "A" individual limited access DAS permits than did the full set of limited access DAS vessels with Gloucester as principal port in 2003. Neither the bias in the sample toward businesses with multiple vessels, the greater than average size of the businesses' vessels, nor the higher proportion of "A" permits on the businesses' vessels presents a serious impediment to interpretation of the data from the sample. Regarding the bias, we know the direction of this bias –toward business owners with multiple vessels – and so we can simply note that the sample has a larger percentage of 'large' groundfishing businesses in Gloucester than there are, overall, in Gloucester. (What is interesting about this is that, as discussed below, 'large' is relatively small in Gloucester.) Regarding the greater than average vessel size of the vessels owned by the businesses

in the sample and the higher proportion of A permits on these vessels, these, too, should not detain us. As has been highlighted throughout, the aim in this study was to examine a randomly selected sample of *businesses*, not vessels per se; we aim to characterize the businesses and, only as part of this, the vessels the businesses own and operate.⁵⁰ Furthermore, the vessels owned by the businesses include some very small vessels (the smallest was 35 feet, the first quartile was 41 feet) and the businesses' practices with these vessels are described along with their practices with the larger vessels. While proportions of practices with vessels in the sample may not match proportions of practices with vessels in the full population of 145 limited access DAS vessels, the *range* of practices with vessels in the sample likely mirrors the range in practices with vessels in the full population.

The picture of Gloucester groundfishing businesses drawn by the data from the sample – a picture of the businesses in 2003 – may be summarized as follows:

Structures:

The business owners are men⁵¹; they own their commercial fishing vessels individually (or with spouses) (56%), jointly with one or two male family members (brothers, cousins, brothers-in-law, etc., with or without spouses as well) (19%), or, for some with multiple vessels, individually (or with spouses) *and* jointly with others, family members *or* non-family members (here, too, however, spouses may also be included) (25%). Overall, however, only 6% of the vessels (2/30 of the vessels owned by the businesses in the sample) were owned jointly with persons *not* family members. Ninety-four percent (94%) of the vessels were owned by individuals (some with a spouse) (67%) or by a very small group of family members (27%).

Only 7% of the vessels owned by the businesses were operated (captained) by someone who was neither an owner of the vessel nor a family member of an owner, and all operators (captains) were men. Seventy-six percent (76%) of the businesses' vessels were operated by an owner (either the owner interviewed or a co-owner), and 17% were operated by a family member of an owner (son, nephew, or male cousin). The owners in the sample who did not operate their vessels – or did not operate all of their vessels -- remained involved, from shore, or from the wheelhouse of another vessel, in the operation of their vessels.

Family members of business owners also played additional roles, beyond those of co-owner and/or vessel captain. Thus, some worked as crew on vessels (36% of the vessels owned by the owners had at least one family member aboard as crew; this was

⁵⁰ Moreover, the vessels owned by the businesses in the sample, were they to be treated as a vessel sample per se, would not constitute a random vessel sample: They were not randomly selected, they are the vessels owned by a sample of businesses randomly selected (but for the unavoidable bias toward businesses with multiple vessels).

⁵¹ Spouses may be co-owners, as spouses co-own some vessels; however, the extent to which spouses are co-owners requires additional analysis.

separate from the family members captaining vessels). In addition, 69% of the business owners were born into families in which at least one member of the preceding generation was a fisherman and some of these owners claimed many forebears in the business. Sixty-three percent (63%) of the owners first fished with – and considered themselves to have learned fishing from – family members in a preceding generation. Among those who did not learn from family, there were some -- 13% of owners overall – who likened the person from whom they had learned commercial fishing to a family member (like “a father”). (Others who had not learned from family members recalled with precision and respect the name of the person from whom they had learned and the circumstances of that learning.)⁵²

Notably, 50% of Gloucester’s groundfishing business owners in 2003 were Sicilian-Americans, of first, second, or third generation; 25% were first generation (all of whom had lived in and fished from Gloucester – while in some cases fishing from elsewhere as well – from at least 1983, the earliest year inquired into in the study).⁵³ Equally notably, however, while there is a common assumption (bearing empirical inquiry not – yet – carried out in this study) that it is among Sicilian-Americans that kinship structures are key to fishing businesses in Gloucester, the data produced here show that – whatever the extent of the relationship between kinship structures and fishing businesses among Sicilian-Americans in Gloucester – there is a relationship between kinship and business in fishing businesses in Gloucester *other* than those owned by Sicilian-Americans. Even were all the Sicilian-American business owners in the sample among those born into families with a commercial fisherman (or commercial fishermen) in a preceding generation (again, an inquiry not yet undertaken), they would not account for all the business owners in the sample (69%) for whom this is the case.⁵⁴

The importance of families in the social organization of fishing businesses at present should not obscure the extent to which some fishing businesses at present are individual enterprises, with a single individual (in some cases with a spouse) the sole owner. Fifty-six percent (56%) of the business owners owned their vessels (whether a single vessel or multiple vessels) individually (in some cases with a spouse), and across all the business owners, 67% of the vessels owned were individually owned (again, sometimes with a spouse). Finally, while the data in the study were insufficient for quantification, it was also clear that many but not all of the business owners used the corporate form to hold their vessels, both in cases in which a single individual held the

⁵² The study did not examine other roles that family members may be playing in fishing businesses; the obvious one to have looked at – or to look at in the future – would be bookkeeping and other shoreside financial work associated with commercial fishing businesses.

⁵³ Miller and Van Maanen reported in 1979 that, at that time in Gloucester, “about 85% of the fishermen (and owners) of the dragger fleet” were “of Italian, Italian-American, and Sicilian descent” (1979:379).

⁵⁴ Further systematic study of the relationships at present between fishing businesses and kinship structures in New England is clearly called for; compare, in earlier years: Poggie and Gersuny (1984), and Terkla, Doeringer, and Moss (1988).

corporation holding the vessel and in which a small group of owners held the corporation.

Data on the total number of crew *per groundfishing business* remain to be analyzed (a matter made complicated by the use, in many cases, of the same crew on two or more vessels owned by a business). However, each business had no more than four crew per vessel, and this included groundfish vessels 75 feet, 85 feet, and 96 feet long. The mean and the median per vessel were three crew (the mean was 2.9), and only about 12% of the vessels had only one crew (i.e., a captain – in all cases, an owner – fishing alone).⁵⁵

Strategies:

The number of vessels held by groundfishing businesses could well be considered a matter of the structure of the businesses rather than a matter of their strategies (as the number of crew per vessel could well be considered a matter of strategy rather than of structure). However, the number of vessels held by businesses is included here, quite intentionally, as matter of strategy. All but one of the vessels owned by the business owners were limited access DAS groundfish vessels (albeit with varying sets of other federal and/or state permits) and fully 88% of the business owners were fishing, in 2003, for groundfish (using, among them, 80% of the vessels owned among them). (Only 25% of the business owners were fishing *exclusively* for groundfish, however, a matter taken up below.) Thus, a large majority of the groundfish business owners were in fact in the business of fishing for groundfish in 2003. And, as shown, each business owner held, individually or jointly, one to four vessels, and both median and mean were two vessels (the mean was 1.9). The vessels owned ranged in size from 35 feet to 137 feet (the largest vessel with a limited access DAS permit, however, was 111 feet).

As described in the Introduction, by 2006, there had been four reductions in vessels' DAS allocations since the establishment of vessels' baselines and the initial reduction in 1994 (in 1997, 2002, 2004, and 2006). The 1997 cut had halved vessels' allocations from their baselines, leaving vessels with "fleet" or "B" limited access DAS permits – by far the prevalent limited access DAS permit type – with 88 DAS to fish for groundfish in a year. As neither permits nor DAS could be consolidated at that time, some groundfish businesses invested in buying one or more additional limited access DAS vessel(s) (while permits are technically not transferable, they are bought and sold as part of complex vessel transactions), fishing each vessel its full complement of DAS. This reliance on multiple vessels as a strategy in the groundfish business was becoming even more critical by 2003; at that time, business owners had experienced a further reduction in their vessels' DAS (in 2002, brought about as a result of federal litigation challenging NOAA Fisheries failure as of then to produce the 10-year stock rebuilding plans and attendant regulations) and were looking straight into the expected 2004 cut

⁵⁵ The data on crew, as indicated in Part III, was based on 87% of the vessels owned by the business owners, all of which were vessels targeting groundfish.

(to accompany the 10-year stock rebuilding plans finally expected that year). Finally, in addition, there was much talk at the time in the regulatory arena about intentions to promulgate DAS transfer mechanisms as part of the 2004 regulations to allow, for the first time, consolidation of DAS, temporary or “indefinite,” from multiple permits onto a single permit.

Thus, while we do not know, from the data, *when* the Gloucester groundfish business owners bought the vessels they held in 2003, it comes as no surprise that so many owners held more than one limited access DAS vessel in 2003: only 31% of the owners held, individually or jointly, one vessel; 69% held two, three, or four vessels. Moreover, it will be interesting, when the 1983 and 1993 data for these business owners are analyzed, to examine the owners’ histories regarding numbers of vessels owned and patterns of vessel ownership (by them or by others’ businesses or vessels in or on which they may have worked in those years). Other factors may well have driven numbers and patterns in those years, however, and so comparisons must be cautious. Finally, as discussed throughout this report, we know that the sample was biased toward businesses owning multiple vessels (but we do not know by how much); what is of note more than anything is the fact that even with this bias, the groundfishing businesses were very small, with an average of two groundfish vessels per business, with some of the vessels owned individually and some jointly.

Strategies apart from the number of vessels (and the number of crew per vessel) involved the species to be targeted, the areas to be fished, the gears to be used, and the ports to be used. These strategies may be usefully considered fishing and mobility strategies. The businesses targeted one to three species or species groups in 2003. Only 31% of the business targeted only one species group (25% of which targeted the groundfish species group alone and 6% of which targeted lobster alone). The balance – 69% - pursued two (44%) or three (25%) species or species groups. Not all the businesses targeted groundfish in 2003; 88% pursued groundfish, while the remaining 12% pursued lobster or herring and hagfish. It should be remembered that all the businesses had a limited access DAS groundfish permit on at least one vessel (this was one of the defining characteristics of the sample of businesses studied). By 2003, however, fishery-wide, some vessels’ limited access DAS permits had lost the greater part of their usefulness; the 2002 DAS reduction was the first in the series of DAS reductions to reduce vessels’ DAS allocations to a percentage of DAS actually used in a former period of time (i.e., to base the reduction on DAS use and fishing “history”), and it limited vessels that had not used their DAS in the then-relevant time period (1996-2000) to 10 DAS per year. Whether the Gloucester groundfishing businesses not targeting groundfish in 2003 were all among those so limited by the 2002 DAS reduction, we do not know; it should be noted, however, that the owner of one business not targeting groundfish in 2003 was extremely “bitter” – his word – about his vessel’s loss of DAS.⁵⁶

⁵⁶ If this business owner was referring to the 2002 cut – and was among those whose vessels were allocated 10 DAS in 2002, he would have had to have had no record of DAS use and groundfish landings from 1996-2000, i.e., , not to have targeted (or have a record of targeting) groundfish in those years.

Twenty-five percent (25%) of the groundfishing businesses, as indicated, targeted groundfish alone in 2003; 63% of the businesses targeted groundfish *and* one or two other species as well, specifically, one or two of: monkfish, lobster, whiting, scallops, dogfish, and red crab. (The remaining 12%, as indicated, pursued lobster, and herring and hagfish.) It should be pointed out that we do not know, among the businesses targeting more than one species or species group, the relative percentage of time, effort, or landings associated with the pursuit of each species or species group. What we do know, however, is that 71% of the businesses fishing for groundfish (63% of the businesses overall) were fishing for groundfish and one or two other species as well.

To pursue these species, the businesses used, among them, seven different gear types in 2003. The majority, however, - 63% - used only one gear type in 2003. This one gear type varied, however; 44% used bottom trawl exclusively, 13% used gillnets exclusively, and 6% used traps exclusively. Thirty-eight percent used two gear types in 2003, and 6% used three gear types in 2003.

In pursuing these species, moreover, the businesses took – or sent – their vessels to the inshore Gulf of Maine, the offshore Gulf of Maine, Georges Bank (including the Canyons), and to relatively near shore areas 60 or more miles from Gloucester, an area off Cape Cod (“the outer Cape”) and an area off Nantucket. Only 40% of the businesses fished in a single area (using these large and general ‘areas’ as a measure); these 40%, it should be noted, fished exclusively in the inshore Gulf of Maine (in areas including Massachusetts Bay, Ipswich Bay, Stellwagen Bank, Jeffreys Ledge, and others). The remaining 60%, however, fished in two (33%), three (20%), or four (7%) of these general areas in 2003. They also fished anywhere from ‘0’ miles out (i.e., in state waters) to 200 miles from shore. Only 27% of the businesses fished their vessels exclusively within 20 miles from shore; another 20% fished from the inshore to 50 miles from shore; 13% fished from the inshore to 100 miles from shore; 33% fished from the inshore to 150 miles from shore; and 7% fished exclusively offshore (exclusively from 50 to 200 miles from shore).

The businesses took – or sent – their vessels for trips of varying length, reflecting the variation in areas fished and distances from shore fished: One-third of the businesses (33%) made day trips only (all or part of a single day) with their vessels, and another 20% made short only trips with their vessels (one to three days); thus 53% made trips one to three days in length. The remaining 47% took or sent their vessels out for trips that ranged from one day to nine days, and only 13% sent their vessels for trips that were no shorter (and – as it happens, no longer) than five days.

Finally, in pursuing these species – and in selling them once they were caught – the businesses used multiple ports: to land fish, sell their fish, and tie-up their vessels. As discussed in detail in Part III, the businesses used, among them, nine different ports to land and sell fish and to tie-up their vessels; these ports ranged to the south to New York’s Fulton Fish Market (a selling port, i.e., to which some businesses trucked part of their catch) and to the north to Cap-Pele, New Brunswick, Canada (another selling port,

to which part of a business' catch was trucked), an onshore span (calculated in driving miles) of some 775 miles. Not all businesses used multiple ports, it is important to point out: Forty-four percent (44%) used one port alone in 2003 for landing fish, selling fish, and tying up vessels (in doing so, these 44% of businesses used a single port for a full 60% of the vessels owned by the businesses). But, 38% of the businesses used two ports, 13% used three ports, and 6% used four ports. As indicated, these were not all ports to which businesses actually took their vessels; some (four unique ones) were selling ports only, i.e., ports to which the businesses took their fish but not their vessels. However, all were ports used by the businesses in 2003.

Mobility:

Mobility – of vessels and of vessels' catch – was a strategy for over half the groundfishing businesses in Gloucester in 2003. Mobility was *not* a strategy for the 40% of businesses that fished exclusively in the inshore Gulf of Maine. Nor does it appear that mobility was a strategy for the 44% of businesses that used only one port (for landing fish, selling fish, and tying up vessels) in 2003. (The relationship between these two sets of businesses has not been explored in the analysis thus far, but a substantial overlap between the two sets is expected.)

Mobility – of vessels – was a strategy for the 60% of businesses that fished in more than one area in 2003 (including the near shore areas far from Gloucester, i.e., off Cape Cod and off Nantucket), and the 53% of businesses that fished over 50 miles from shore in 2003 (87% of which, or 46% overall, also fished in the inshore). Further, the mobility of vessels – and of vessels' catch – was a strategy for the 56% of vessels that used more than one port – from two to four ports each – in 2003. These ports, as shown, were used to land fish, to sell fish, and to tie-up vessels.

Two very important points remain to be made about the use of mobility by the approximately half of the Gloucester groundfishing businesses that used mobility as a strategy in 2003. The first point is from the data themselves: These half or so of the Gloucester groundfishing businesses that used some form of mobility as a strategy in conducting their businesses were strongly anchored in Gloucester itself. In 2003, for 63% of the business owners, Gloucester was place of residence, and for 25% of business owners, place of residence was within 20 miles of Gloucester. This meant, in 2003, a total of 88% of business owners with place of residence Gloucester or a locale within 20 miles of Gloucester.⁵⁷ And, in 2003, 100% of business owners resided – when they were not on their vessels at sea – in their places of residence, i.e., at home. Thus, the 63% of owners for whom Gloucester was home lived in Gloucester in 2003, and the 25% of owners for whom a locale within 20 miles of Gloucester was home lived within 20 miles of Gloucester. For the approximately 50% of business owners for which mobility – in some form – was a strategy in 2003, therefore, we may say, first, that

⁵⁷ Moreover, all 63% for whom Gloucester was place of residence in 2003 had also had Gloucester as place of residence in 1993 and in 1983; so, too, the 25% of owners with place of residence within 20 miles of Gloucester in 2003 had had place of residence within Gloucester in 1993 and 1983.

mobility was a strategy used by – and for – the business, and, second, that, mobility - as a strategy for the business – was used in service of a goal of fixity, that is, in service of the goal of allowing the business owner to remain at home, in or near Gloucester.

The second point about mobility derives from what the data do not tell us: This is the *degree* of mobility used by the business owners that used mobility as a strategy. To determine degrees of mobility, we would need to know, for the businesses that used multiple areas of ocean to fish, multiple distances from shore to fish, and multiple ports, the relative frequencies with which (or relative amounts of time or effort in which) different areas, distances, and ports were used. Those are data we do not have, and collection of such data is for another time. What we do know, however, as a result of this study, is that mobility, in some form and in some degree, was a strategy for about half the Gloucester groundfishing businesses in 2003. And, we may further observe that it was a strategy used in service of enabling Gloucester groundfishing businesses to remain Gloucester groundfishing businesses.

Finally, it remains, also, to future work to discern the use of mobility, overall, in 2003 relative to other years. Multiple factors affect mobility in any given year; among these are: stocks' conditions, market conditions, business strategies and investment decisions, the costs of inputs (e.g., fuel), knowledge and experience, and the myriad rules governing fisheries. It is worth noting that, in 2003, rules governing the New England groundfishery likely had contradictory effects on businesses' mobility strategies in the groundfishery: On the one hand, the rolling closures of inshore waters may have led some fishing businesses to become more mobile than they would have been otherwise, leading them, for example, to send their vessels south to fish (e.g., off Cape Cod and off Nantucket) when inshore waters off Gloucester and Cape Ann were closed. On the other hand, the DAS effort control program – in particular, the then-newly-effective reduction in vessels' DAS allocations (in effect in 2002) – may well have constrained businesses' use of mobility strategies for their vessels: The limits on vessels' time on the water may well have restricted vessels' movement on the water. However, here, too, contradictory effects of the rules may be expected; some few businesses may well have compensated for limits on time on the water by taking their vessel(s) from homeport (for most, Gloucester) to another tie-up port (e.g., New Bedford) to be closer to certain fishing grounds during part of the year.

V. Conclusion

Using data collected from a random sample of groundfishing businesses based in Gloucester in 2003, this study investigated the business' structures and strategies in 2003 and explored the question whether mobility was a strategy for these businesses.⁵⁸ It is hoped that the results may be helpful to industry members, fishery managers, the City of Gloucester, and others who seek to understand the New England groundfishery and plan for its future. It is also hoped that further research will focus on the structures and strategies of fishing businesses, and that, in this regard, research – and planning –

⁵⁸ As indicated, moreover, further investigations of the data collected in this study are also planned.

will recognize and focus on the fact that, as is insisted in the field, commercial fishing *is a business*. Just as importantly, however, it is hoped that the focus on businesses so needed in the analysis of fisheries – and the New England groundfishery in particular – will help to illuminate – and not obscure – the intersections among businesses, families, and communities in fisheries, in particular, in the New England groundfishery.

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