5.4.6.1.1 Potential impacts of DAS reductions on vessel location

Public comments on Amendment 13 identified Maine's proximity to offshore groundfish fishing grounds, and the increased steaming times required to reach those grounds, as an intrinsically linked component of DAS reductions that will disproportionately impact the Maine groundfish industry. The specific problem identified appears to be the perception that Maine vessels will relocate to Massachusetts. This issue has also attracted attention in local media both inside and outside of Maine (see "Task force will help protect both fish, groundfishermen," Portland Press Herald, Sept 4, 2003, among others). While public comments focused on Maine, similar arguments could be made for other states.

The theory is investigated in several ways. Changes in documented homeport and principal port locations are tracked as an attempt to understand the "baseline" level of state-to-state vessel transfer over time. Landings and fishing patterns for Maine-based vessels are quantified in an attempt to determine which vessels and which ports are likely to be impacted. Product caught on Georges Bank and landed in Maine ports is quantified, losses due to differential transit times for affected fishing trips are modeled, and the opportunity costs associated with landing Georges Bank fishing trips in Maine is estimated. An upper bound estimate of potential losses for the Maine economy is provided. Finally, the issue of steaming time for offshore trips is put in perspective by comparing the percentage of time spent steaming on offshore and inshore fishing trips.

The results show that Maine's groundfish fleet has shrunk by roughly 40% since 1995, which is consistent with the reduction in multispecies permit holders region-wide (35%). Groundfish revenues in Maine are up approximately 50% from their late-1990's lows. Total revenues generated by Maine vessels but landed outside of Maine have remained constant at roughly 10% of total groundfish revenues from 1995 through 2002. Of 159 active groundfish vessels in Maine in 2002, only 29 reported making trips in statistical areas that are farther from Maine ports than Massachusetts' ports (areas 514, 521 and 522, principally). Twenty Maine vessels landed trips from these statistical areas in Massachusetts in 2002, and this number has remained nearly constant since 1999. Costs associated with steaming time for trips occurring in these statistical areas were roughly 20% of per-trip groundfish revenues for trips reported in statistical area 514, but only 3% of gross revenue in statistical areas 521 and 522. Analysis of steaming time for inshore and offshore trips shows that vessels fishing inshore may spend a significantly greater percentage of their trip time steaming than do vessels fishing offshore trips. Finally, lobster landings data from these areas highlights one potential source for increased revenues for Maine trawlers, demonstrating that the opportunity costs of fishing in Georges Bank statistical areas may be compensated.

Relevant background information on the groundfish fishery in New England

To properly frame the issues surrounding potential economic impacts associated with vessel transfers out of Maine, it is important to understand the trends in vessel movement between states and the efficacy of potential data fields available for conducting such and investigation.

Choosing an indicator of economic impact: the homeport and principal port data fields

The primary impact being discussed in this investigation is that of product landed. Therefore, the homeport and principal port data fields are investigated to determine their comprehensiveness as indicators of the impacts of landed product in any particular state. The results show that homeport state is not an accurate indicator of a vessel's landings activity. Table 245 indicates that, for example, roughly 55% of groundfish revenue by Maine homeported vessels is landed in Maine. Basing estimations of direct impacts of this nature on the homeport data field will likely miss an important portion of vessels with strong ties to the Maine economy. Instead, the principal port data field (Table 246) reveals a much stronger tie between port state and state of primary landing. While a credible argument can be made that homeport is reflective of the communities (and states) in which vessel owners and crew reside, and therefore spend their incomes,

landings more often occur in the principal port state than the homeport state. For this reason, the principal port state data field is used for the remainder of this investigation.

Homeport state *(x)*	1995	1996	1997	1998	1999	2000	2001	2002	eight-year avg.
CT	29%	17%	27%	29%	35%	24%	52%	56%	**34%**
MA	96%	96%	93%	88%	87%	85%	86%	82%	**89%**
ME	52%	45%	47%	51%	52%	61%	67%	70%	**56%**
NC	29%	42%	7%	87%	99%	76%	32%	99%	**59%**
NH	84%	70%	83%	84%	84%	83%	83%	88%	**82%**
NJ	58%	59%	49%	62%	54%	71%	60%	66%	**60%**
NY	95%	97%	89%	86%	93%	98%	98%	99%	**94%**
RI	63%	58%	49%	53%	67%	72%	70%	81%	**64%**
VA	22%	50%	83%	59%	6%	39%	17%	47%	**40%**

Table 245 – Percentage of revenue (groundfish only) generated by vessels homported in state *(x)* that is landed in that state (source: vessel trip reports).

Principal port state *(x)*	1995	1996	1997	1998	1999	2000	2001	2002	eight-year avg.
CT	90%	91%	97%	85%	94%	79%	88%	93%	**90%**
MA	96%	97%	96%	89%	88%	86%	86%	82%	**90%**
ME	95%	90%	90%	90%	90%	93%	96%	96%	**93%**
NC	60%	97%	100%	87%	99%	87%	35%	100%	**83%**
NH	87%	72%	83%	85%	77%	84%	86%	90%	**83%**
NJ	86%	82%	83%	75%	79%	91%	94%	98%	**86%**
NY	95%	96%	96%	97%	99%	99%	99%	100%	**98%**
RI	93%	91%	78%	89%	91%	88%	86%	91%	**88%**
VA	17%	20%	21%	50%	87%	39%	71%	47%	**44%**

Table 246 – Percentage of groundfish revenue generated by vessels with a principal port state *(x)* that is landed in that state (source: vessel trip reports).

Changes in homeport and principal port in New England

New England vessels routinely change ports for any number of reasons: vessel sale or ownership change, changes in fishery/target species and improved access to markets or dealers are just some of the many reasons a vessel may change it's documented homeport. Table 247 shows the total change in the number of permits listing each state as their documented principal port (Table 248, which shows the same data for the homeport data field, is included for reference). In these tables, only vessels possessing a valid limited access multispecies permit are counted.

Over the eight-year time series, groundfish vessel retention in Maine was roughly consistent with the overall reduction in fleet size across the New England region. With the results of the groundfish vessel buyback program figured in (Table 249), Maine's groundfish fleet has shrunk by 27% since 1995 (the total fleet has been reduced by 24%).

	1995	1996	1997	1998	1999	2000	2001	2002	% Change 95 - 02	% Change 95 - 02 (excl. vsl buyback)
CT	29	29	31	32	30	29	26	23	-21%	-3%
MA	1,029	831	849	800	796	777	761	680	-34%	-23%
MD	10	9	9	9	8	9	8	6	-40%	-20%
ME	369	307	295	281	285	291	273	217	-41%	-27%
NC	53	26	24	20	22	21	24	26	-51%	-45%
NH	106	78	80	76	87	89	85	80	-25%	-16%
NJ	129	88	83	89	89	103	103	89	-31%	-19%
NY	180	154	151	148	151	144	134	125	-31%	-20%
RI	202	161	159	158	162	164	158	139	-31%	-21%
VA	43	16	15	12	11	12	10	11	-74%	-74%

Table 247 – Limited access multispecies permit holders by principal port state, calendar years (Source: multispecies permit database).

	1995	1996	1997	1998	1999	2000	2001	2002	% Change 95 - 02
CT	14	17	19	20	21	18	17	16	14%
MA	1258	1009	1003	923	917	884	848	746	-41%
MD	5	5	5	5	4	5	7	5	0%
ME	219	181	179	191	199	219	216	178	-19%
NC	36	22	21	19	22	21	23	25	-31%
NH	86	61	68	65	76	78	78	76	-12%
NJ	77	50	52	63	65	79	83	75	-3%
NY	232	193	185	178	174	169	156	143	-38%
RI	116	93	87	104	112	123	126	110	-5%
VA	56	24	23	19	17	18	13	14	-75%

Table 248 – Limited access multispecies permit holders by homeport state, calendar years (source: multispecies permit database).

	Number Vessels
CT	5
FL	1
MA	115
MD	2
ME	53
NC	3
NH	9
NJ	15
NY	19
RI	20

Table 249 – Principal port state locations for vessels/permits purchased in the 1996 and 2002 buyback programs.

As an attempt to gauge where vessels that departed Maine went, and where vessels that changed their principal port to Maine came from, Table 250 and Table 251 track those changes that occurred intra-year

(i.e., vessels that ended the year with a different principal port state than they began the year with). This list is not comprehensive, as it does not track vessels that changed principal ports on their annual permit renewal application—only vessels that changed principal port during the year are tracked here. This does, however, provide insight into vessel transfers.

State (*X*)	1995	1996	1997	1998	1999	2000	2001	2002	total
AK	.	.	.	.	.	1	.	.	1
CT	1	.	.	.	.	.	.	.	1
MA	1	1	5	5	6	7	7	3	35
NC	.	.	.	.	.	.	1	.	1
NH	.	.	1	.	1	.	1	.	3
NJ	1	.	1	.	.	.	1	1	4
NY	.	.	.	1	1	1	1	.	4
RI	.	.	.	.	.	1	.	.	1
VA	.	.	1	.	.	.	.	.	1

Table 250 – Number of vessels changing principal port state from Maine to state *X* (source: vessel permit database).

State (*X*)	1995	1996	1997	1998	1999	2000	2001	2002	total
CT	.	.	.	1	.	.	.	.	1
MA	4	1	2	3	7	6	3	2	28
NC	.	.	.	.	1	.	.	.	1
NH	1	.	.	.	.	1	.	.	2
NJ	.	.	.	.	.	1	.	.	1
NY	.	.	.	1	.	.	.	2	3
RI	.	.	1	1	.	.	.	2	4

Table 251 – Number of vessels changing principal port state to Maine from state *X* (source: vessel permit database).

5.4.6.2 Preliminary data regarding the groundfish fishery in Maine

Overall, the number of vessels actively fishing for groundfish has declined across New England by 23% over the eight-year time series (Table 252). During this time, the number of vessels principally-ported and landing in ME has decreased 34%. Pro-rated VTR-reported revenues have increased 58% for New England as a whole, while ME pro-rated VTR-reported revenues have rebounded from a steep decline into the late 1990's and are now showing revenues approximately equal to those in 1995 when adjusted for inflation. Non-Maine vessels landing in Maine are contributing less to the state in terms of revenue now than in the late 1990's.

Rolling closures and the GOM cod trip limits likely contributed to declines in revenue and, possibly, the disproportionate decrease in active groundfish vessels (relative to New England as a whole). The state prohibition on landing lobsters may also disadvantage Maine ports relative to their New Hampshire and Massachusetts counterparts. Average distance to the fishing grounds, discussed in some detail later in this section, may contribute as well, but is likely to be much less significant.

	Active NEMS limited access permit holders		Active NEMS limited access permit holders listing ME as principal port state		Active NEMS limited access permit holders listing ME principal port and landing in ME		Active NEMS limited access permit holders not listing ME as principal port but landing in ME	
year	**# vessels**	**value**	**# vessels**	**value**	**# vessels**	**value**	**# vessels**	**value**
1995	1812	$79,352,000	258	$21,217,000	251	$19,880,000	46	$1,108,000
1996	1759	$76,184,000	246	$16,911,000	236	$16,008,000	35	$1,693,000
1997	1533	$76,497,000	213	$15,073,000	207	$14,555,000	27	$1,580,000
1998	1553	$84,240,000	200	$15,313,000	193	$14,409,000	19	$1,690,000
1999	1524	$85,344,000	173	$14,459,000	167	$13,515,000	21	$1,460,000
2000	1535	$98,207,000	184	$19,674,000	177	$18,058,000	28	$1,297,000
2001	1485	$111,514,000	183	$21,257,000	174	$19,132,000	27	$743,000
2002	1396	$113,075,000	171	$21,887,000	163	$19,356,000	21	$792,000

Table 252 – Number of NEMS limited access permit holders actively fishing and revenue generated from landings (source: calendar year, prorated vessel trip reports).

	NJ		**NY**		**CT**		**RI**		**MA**		**NH**		
Year	**# vsls**	**# trips**	**# vsls**	**# trips**	**# vsls**	**# trips**	**# vsls**	**# trips**	**# vsls**	**# trips**	**# vsls**	**# trips**	**Total Revenue**
1995	2	2	16	77	10	171	5	10	2	2	1	3	$1,337,000
1996	2	2	18	48	8	267	2	3	2	5	.	.	$903,000
1997	2	3	22	303	6	115	.	.	.	.	3	5	$518,000
1998	3	3	18	158	4	67	.	.	.	.	3	15	$904,000
1999	.	.	23	63	7	157	.	.	.	.	2	4	$944,000
2000	.	.	22	87	7	179	.	.	2	2	3	29	$1,616,000
2001	.	.	24	115	7	135	.	.	2	21	3	14	$2,124,000
2002	.	.	25	147	7	96	1	1	1	1	1	13	$2,503,000

Table 253 – Number of vessels listing Maine as their principal port state but landing outside of Maine; breakdown by state of landing (source: prorated vessel trip reports; revenue in 2002 dollars).

annual % change	**ME**		**NH**		**MA**		**RI**		**NY**	
	pp state	**transient**	**pp state**	**transient**	**pp state**	**transient**	**pp state**	**transient**	**pp state**	**transient**
# vessels	-7%	-13%	3%	-4%	-3%	-13%	-5%	11%	-6%	11%
revenue	3%	9%	11%	-3%	11%	5%	21%	85%	22%	175%

Table 254 – Annual rate of change in number of vessels landing groundfish at least once and total revenue of landings for each state, distinguished between vessels listing the landing state as their principal port state (pp state), and vessels with principal port states that differ from the state they landed the trip in (transient) (source: vessel trip reports and vessel permit database).

Table 253 shows that a number of vessels with their principal port state listed as Maine currently land some groundfish outside of Maine. The total amounts of these landings range from seven to eleven percent of the total groundfish revenue generated by Maine principal-ported vessels. What is significant is that these vessels appear to have established ties with dealers outside of Maine, thereby decreasing (albeit to an unknown degree) one source of potential cost increases associated with landing product outside of a principal port state. Table 254 shows that, while the number of registered vessels landing trips in their principal port state has declined for all states except New Hampshire, overall revenues have increased for

all states. Maine, notably, has shown the smallest average rate of annual revenue increase among those states where groundfish are typically landed.

Quantifying the potential impacts of DAS reductions on Maine
This section attempts to quantify the impacts of DAS reductions on Maine, first by determining which trips and which vessels are most likely to be impacted, second by estimating the opportunity costs imposed upon impacted trips, and third by providing an upper-bound estimate for potential overall impacts on the Maine, and New England, economies.

Determining potentially impacted trips
Amendment 13 DAS reductions may range anywhere from 35% to 65% in allocated DAS, bringing the pre-settlement agreement Fleet DAS allocation from 88 DAS down to between 57 and 31. Individual DAS allocations will be reduced similarly. This portion of the analysis utilizes extant 2002 trip-level data and therefore the impacts are not reflective of future DAS reductions. The non-linear relationship between utilized DAS and fleet revenues means that these results should not necessarily be reduced by a corresponding factor to accommodate DAS reductions. Furthermore, because the necessary inputs data has a spatial component it is not possible to factor in anticipated stock-specific F reductions to calculate potential impacts. Actual trip-level data is therefore deemed to be the be the best for these purposes but, due to the significant reductions proposed, the resulting estimates are likely to be high.

To determine who may be affected, and by how much, the following criteria are used to sort trips and create an appropriate data set:

- 2002 landings data

Trips by vessels listing Maine as their principal port state
Trips landing groundfish in Maine
Trips reporting fishing in statistical areas other than 511, 512, 513, and 515

Because the perceived problem is the direct shift of product and revenues from Maine to Massachusetts, trips made by Maine vessels and landed in Maine are the focus. 2002 data is utilized to reflect current regulatory and stock status environments. Trips occurring in areas closer to MA than ME are assumed to be potentially impacted and, consequently, trips reported to have occurred in statistical areas 511, 512, 513 and 515 are eliminated from consideration (leaving the focus on areas 514, 521 and 522).

Figure 215 and Table 255 show landing by statistical area for all Maine vessels—note that these data show the vast majority of Maine groundfish landings coming from statistical areas 512, 513 and 515. This begins to show that the differential impacts of DAS reductions may not affect a large portion of the Maine groundfish fleet. Recent landings from statistical areas 521 and 522 have increased; this increase has been fueled in large part by a dramatic rise in haddock landings (Figure 217), which increased four-fold between 1998 and 2002 as the stock size increased and trip limits were raised.

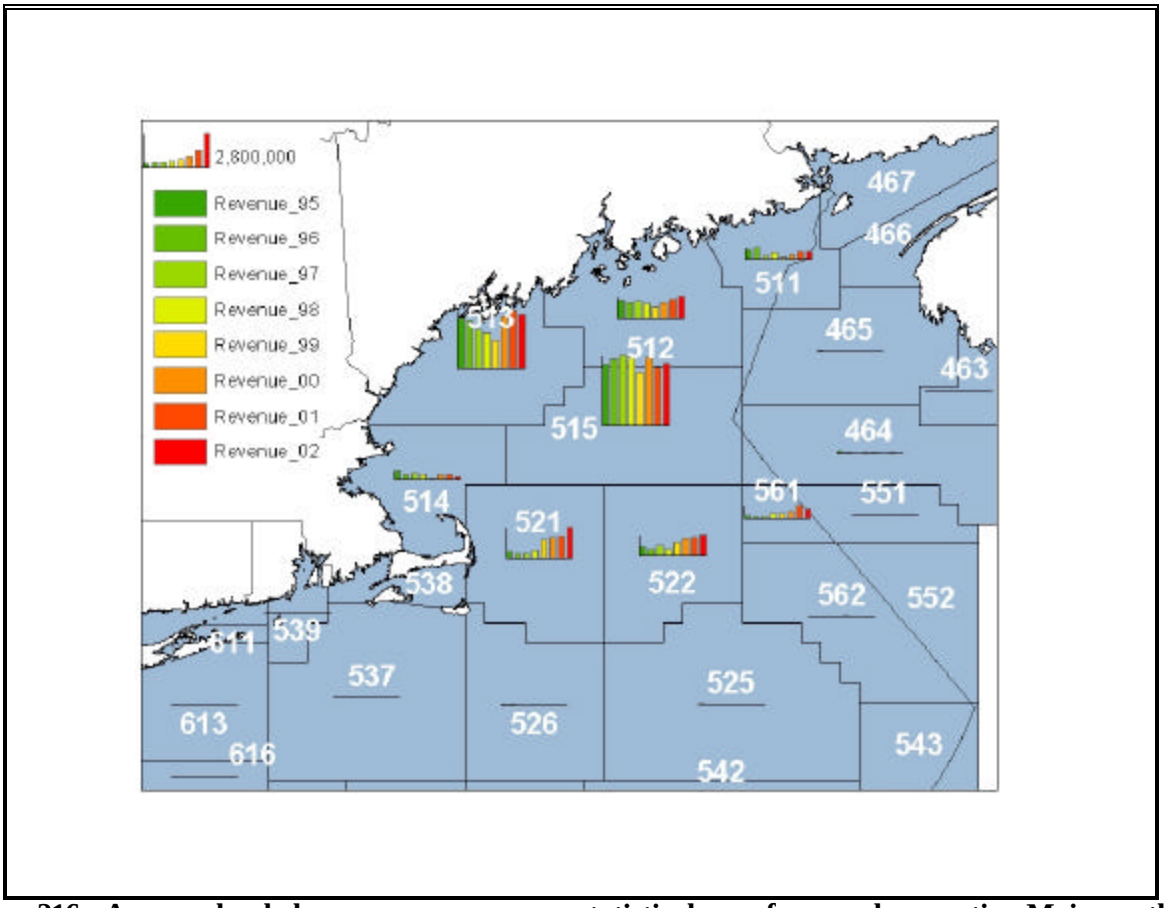

Figure 216 - Average landed revenue per year per statistical area for vessels reporting Maine as their principal port state (source: prorated vessel trip reports, revenues in 2002 dollars).

	1995	1996	1997	1998	1999	2000	2001	2002
511	$1,112,000	$1,096,000	$300,000	$593,000	$234,000	$439,000	$879,000	$862,000
512	$2,438,000	$1,670,000	$1,821,000	$1,745,000	$1,281,000	$1,699,000	$2,005,000	$2,324,000
513	$6,022,000	$4,878,000	$3,840,000	$3,697,000	$2,857,000	$4,952,000	$5,777,000	$5,428,000
514	$880,000	$541,000	$602,000	$490,000	$64,000	$557,000	$513,000	$326,000
515	$7,407,000	$6,663,000	$6,456,000	$6,363,000	$5,370,000	$6,650,000	$6,004,000	$6,315,000
521	$911,000	$559,000	$516,000	$824,000	$2,044,000	$2,138,000	$2,214,000	$3,145,000
522	$1,034,000	$634,000	$884,000	$633,000	$1,310,000	$1,659,000	$1,801,000	$1,987,000
525	$60,000	$43,000		$47,000	$30,000	$2,000	$33,000	$2,000
561	$326,000	$134,000	$94,000	$457,000	$445,000	$729,000	$1,335,000	$926,000
562	$12,000			$4,000	$89,000	$1,000	$22,000	$31,000
SNE	$163,000	$99,000	$12,000	$33,000	$73,000	$36,000	$28,000	$19,000
other	$432,000	$465,000	$491,000	$230,000	$224,000	$223,000	$246,000	$144,000
total	$20,797,000	$16,782,000	$15,016,000	$15,116,000	$14,021,000	$19,085,000	$20,857,000	$21,509,000

Table 255 – Landings revenue by statistical area for vessels listing Maine as their principal port state (source: prorated vessel trip reports).

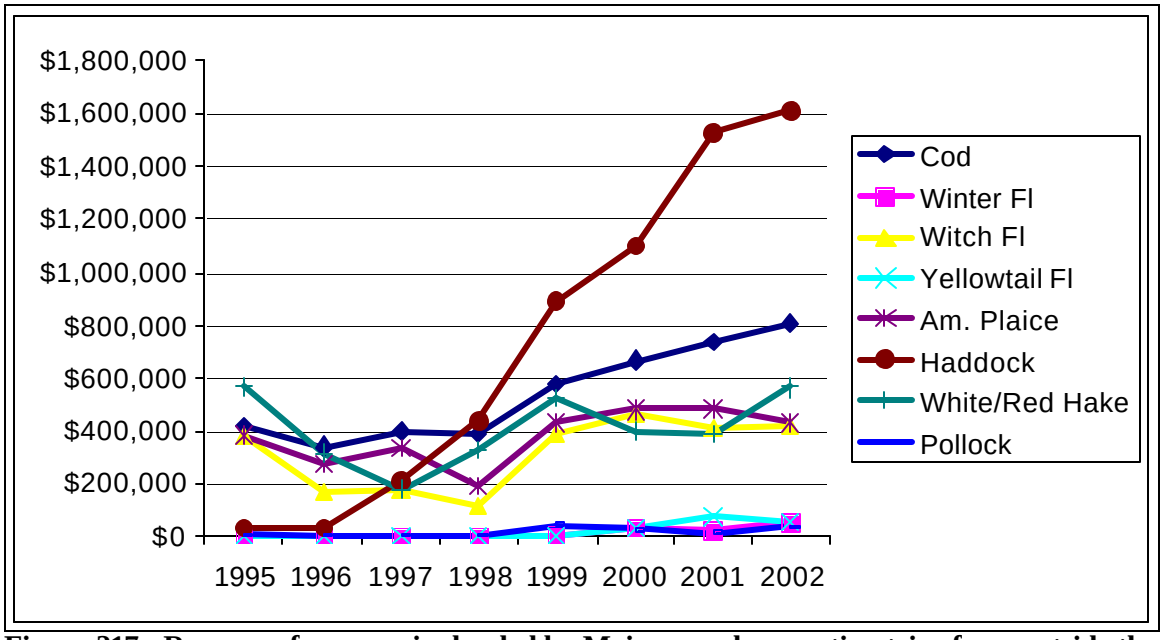

Figure 217 - Revenues from species landed by Maine vessels reporting trips from outside the Gulf of Maine from 1995 through 2002 (source: prorated vessel trip reports, revenues in 2002 dollars).

Table 257 shows that the impacts of Maine vessels fishing on Georges Bank were, in 2002, roughly 22% of the total groundfish revenues for that state. This percentage has increased since the mid-1990's, but has remained relatively constant over the most recent three years Table 257). Thus, it can be estimated that revenues from the fishing trips most likely to be impacted at a differential rate (relative to Massachusetts-based vessels) comprise roughly 20-25% of the total groundfish revenues in Maine. Note that the number of vessels listed in Table 257 refers to all vessels landing at least once in (or out) of Maine; hence, the same Maine vessel may be counted both as landing in and outside of Maine. Table 257 also shows that Maine vessels that do fish on Georges Bank, on average, derive roughly 25-30% of their annual revenue from Georges Bank trips. These data, however, are very noisy (Figure 218) and a handful of vessels earn a significant percentage of their groundfish revenue from the Georges Bank statistical areas.

	vessels fishing outside stat areas 511, 512, 513 and 515 and landing in Maine					vessels fishing outside stat areas 511, 512, 513 and 515 and landing outside of Maine				
	Maine principal port state vessels		other principal port state vessels			Maine principal port state vessels		other principal port state vessels		revenue (ME vsls only)
state	# vessels	# trips	# vessels	# trips	revenue	# vessels	# trips	# vessels	# trips	
1995	41	144	15	43	$2,395,000	16	47	923	13,645	$535,000
1996	32	102	15	37	$1,738,000	10	30	921	13,900	$228,000
1997	35	122	15	28	$1,953,000	7	21	792	12,997	$78,000
1998	28	115	7	24	$2,240,000	11	126	815	12,903	$253,000
1999	41	211	12	51	$4,122,000	20	43	857	12,856	$594,000
2000	35	184	13	47	$4,308,000	19	49	776	11,028	$889,000
2001	33	165	8	17	$4,393,000	21	76	761	12,687	$1,410,000
2002	29	141	2	13	$4,793,000	20	82	701	10,267	$1,733,000

Table 256 - Breakdown of vessels, trips and revenues for fishing trips occurring outside of statistical areas 511, 512, 513, and 515 (source: prorated vessel trip reports).

	Revenues from GB trips	All groundfish revenues	%		% per-vessel annual revenue taken on GB trips	Number vessels	Std. Dev.
1995	$2,395,000	$20,797,000	12%		23%	53	0.23
1996	$1,738,000	$16,782,000	10%		17%	45	0.16
1997	$1,953,000	$15,016,000	13%		27%	42	0.23
1998	$2,240,000	$15,116,000	15%		20%	40	0.22
1999	$4,122,000	$14,021,000	29%		29%	47	0.26
2000	$4,308,000	$19,085,000	23%		31%	47	0.23
2001	$4,393,000	$20,857,000	21%		24%	46	0.19
2002	$4,793,000	$21,509,000	22%		30%	35	0.23

Table 257 – Percentage of total groundfish revenues landed in Maine reported to have come from trips on Georges Bank; and, percent of total annual per-vessel revenue landed from Georges Bank-fished trips for all Maine vessels (source: prorated vessel trip reports).

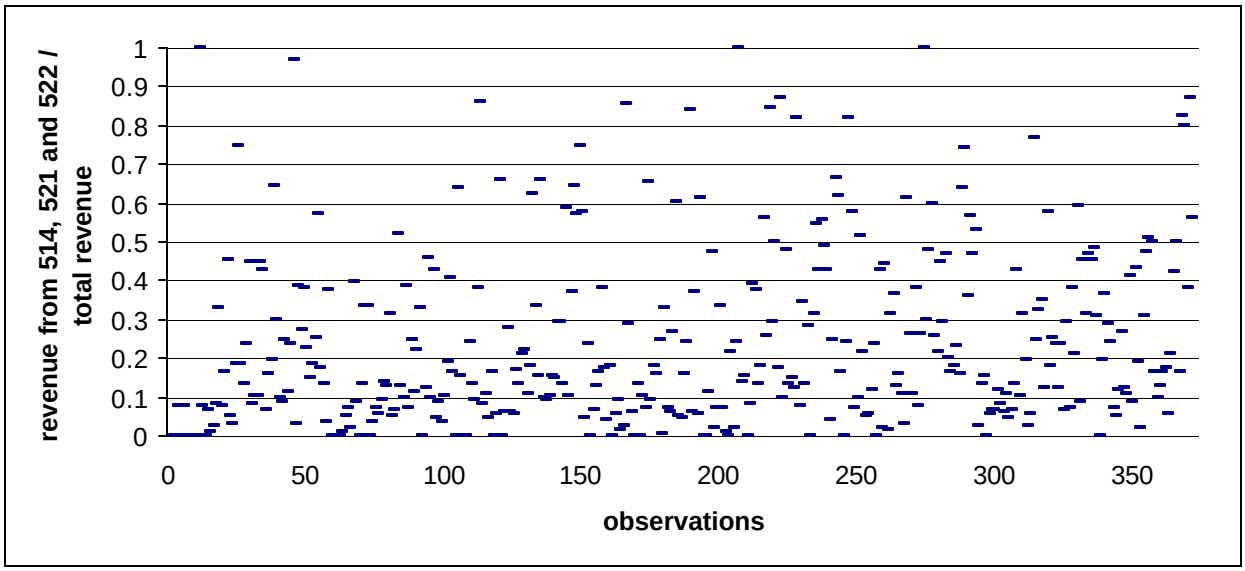

Figure 218 – Scatter plot of George's Bank trips divided by annual revenue for all vessels reporting at least one trip in statistical areas 514, 521 and 522 (source: prorated vessel trip reports).

Quantifying the opportunity costs of additional steaming time

Maine vessels have farther to travel to gain access to Georges Bank than Massachusetts-based vessels. Table 258 shows, for trips landing in various MA and ME ports, the average distance from port, average days absent, per-trip value and per-day value of product landed, and the total number of trips meeting the criteria. It is interesting to note that Maine vessels, on average, produce more revenue per day than their counterparts from other ports for all statistical areas except 522, where they rank second to Gloucester-based vessels. This may be due to the characteristics of the particular vessels (horsepower, gross tonnage, etc), levels of technology present aboard the vessels, or the skill of their captains. In any case, it seems logical that only those vessels able to fish with a high rate of success venture to the Georges Bank fishing grounds.

NEMAREA 514	avg dist (nm)	days absent	value	daily value	# trips
Chatham	44.6	1.24	$1,412	$1,032	194
Glouce ster	23.25	1.17	$888	$661	43,652
New Bedford	70.27	4.42	$6,919	$1,867	1,025
Provincetown	31.1	1.2	$1,041	$812	6,266
Portland	119.02	4.55	$10,184	$2,468	316
VMS Demarc (NB trips)	62.38	4.42	$6,919	$1,867	1,025
NEMAREA 515	**avg dist (nm)**	**days absent**	**value**	**daily value**	**# trips**
Gloucester	105.15	4.4	$9,376	$2,079	1,849
New Bedford	142.24	7.88	$12,125	$1,788	80
Provincetown	42.67	1.9	$364	$143	11
Portland	108.38	5.43	$10,991	$2,120	4,010
VMS Demarc (NB trips)	108.4	7.88	$12,125	$1,788	80
NEMAREA 521	**avg dist (nm)**	**days absent**	**value**	**daily value**	**# trips**
Chatham	36.93	1.09	$1,655	$1,503	22,246
Gloucester	76.16	3.61	$10,360	$2,370	2,094
New Bedford	93.08	6.78	$15,504	$2,880	4,634
Provincetown	35.62	1.7	$1,644	$841	1,232
Portland	132.12	6.63	$19,545	$3,251	573
VMS Demarc (NB trips)	51.2	6.78	$15,504	$2,880	4,634
NEMAREA 522	**avg dist (nm)**	**days absent**	**value**	**daily value**	**# trips**
Chatham	83.44	1.06	$1,996	$1,968	756
Gloucester	142.69	5.75	$16,899	$3,000	935
New Bedford	138.67	7.59	$14,904	$2,208	3,969
Provincetown	89.45	5.48	$9,780	$1,717	59
Portland	191.27	7.39	$17,691	$2,504	601
VMS Demarc (NB trips)	92.99	7.59	$14,904	$2,208	3,969

Table 258 – Avg. distance of reported trips from various ports, with avg. days absent, total value, avg. daily value and number of trips reporting lat/long. VMS_demarc info is for reference only and applies to all vessels reporting landing in New Bedford (source: prorated vessel trip reports 1995 - 2002).

In order to assess the estimated value of lost time due to steaming, the distances listed above were used to determine the differential distance between any two ports (in this case, Gloucester and Portland were used). An adjusted revenue per day absent (RPDA) was computed by subtracting transit time, assuming that the point location provided on the vessel trip report was the beginning and end point for the fishing trip and that fishing did not occur between this point and the landing port. Transit speed was estimated to be 9 knots. The adjusted RPDA was used to estimate the potential for revenue gain based on the reduced distance traveled from Gloucester instead of Portland (assuming that the additional catch does not result in a decrease in RPDA). The following flow chart summarizes this process:

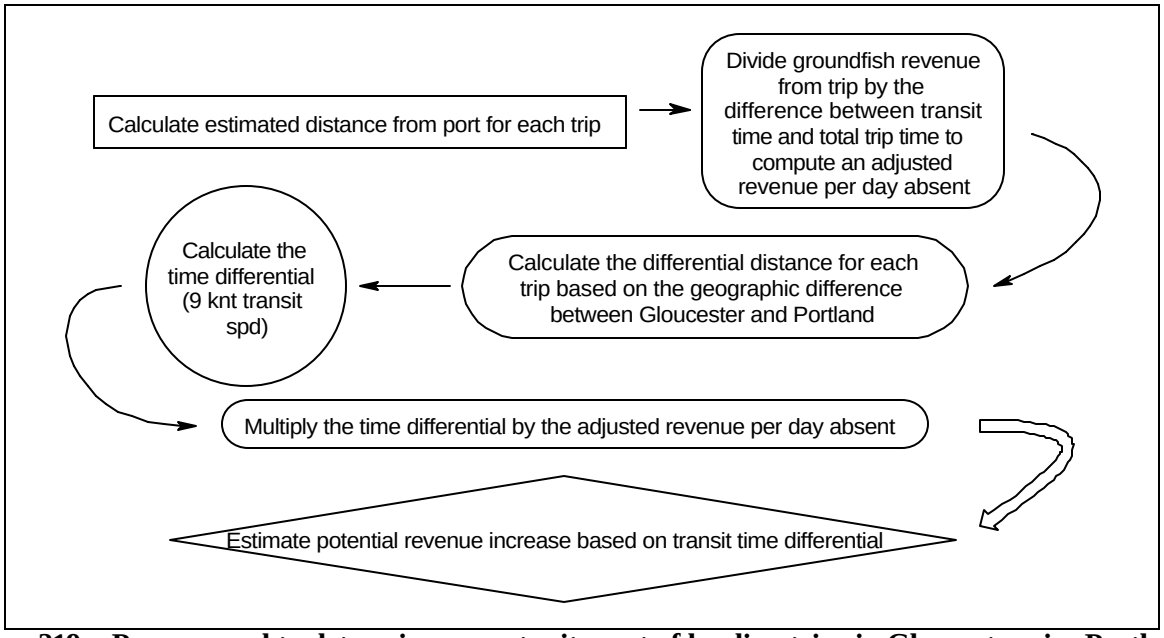

Figure 219 – Process used to determine opportunity cost of landing trips in Gloucester vice Portland.

	Assumed difference in distance to fishing grounds (nm)	Assumed difference - round trip	Assumed add'l hours per trip @ 8 knots transit spd	RPDA	Standard-ized RPDA	# Trips by Portland-based vessels	Potential DAS-based revenue increase through relocation (per trip)	Estimated 2002 potential gross revenue gain (all trips)	Total 2002 gross revenues from areas	Potential percent increase in revenue if trips were made from Gloucester and not Portland
514	95.8	191.54	23.94	$1,989	$2,470	29	$2,191	$63,526	$326,000	**19%**
521	56.0	111.92	13.99	$2,588	$2,808	74	$1,455	$107,648	$3,145,000	**3%**
522	48.6	97.16	12.15	$2,032	$2,165	58	$974	$56,476	$1,987,000	**3%**

Table 259 – Opportunity cost estimates of Maine -based vessels landing Georges Bank trips in Portland vice Gloucester (data based on prorated 2002 vessel trip reports).

Table 259 shows that vessels landing selected trips in Gloucester instead of Portland could expect to increase their revenues by roughly 20% for trips in statistical area 514, and less than five percent for trips in statistical areas 521 and 522. This steaming time opportunity cost likely explains why a relatively few trips are made from Portland in area 514. The roughly five percent opportunity cost for trips in areas 521 and 522 is likely to be compensated by the difference between expected revenues closer to Portland (i.e. statistical areas 513 and 515) and the revenues expected from trips in either 521 and 522 for the trips in these areas. If expected revenues in 513 and 515 were higher at other times during the year, vessels would be expected to continue using Portland as their principal port. If, however, expected revenues on average throughout the year are anticipated to be higher in the Georges Bank statistical areas, Portland-based vessels may be better off (in terms of recouping their opportunity cost) by relocating to Gloucester. A more in-depth, temporally-based investigation would be required to determine when vessels typically make trips to the George's Bank, and what percentage of their overall revenue (vice groundfish revenue, which is used here) is generated from such trips. If vessels have sources of revenue in addition to groundfish, and that revenue is more readily available close to Maine ports, the opportunity cost of landing trips in Maine vice Massachusetts may be significantly more tolerable than if such trips comprised a high percentage of their overall revenue.

Vessel re-location: an upper-bound estimate

It may be possible to quantify, in very rough terms, an upper-bound estimate of the impacts of vessels shifting their fishing operations from Portland to Gloucester. If one is to assume that every trip occurring in statistical areas 514, 521 and 522 in calendar year 2002 will relocat to Gloucester, the direct and indirect impacts of the landed product shift from the Upper and Lower Mid-Coast region of Maine, to the Gloucester region of Massachusetts. In 2002, these vessels landed a total of $4.09 million dollars of groundfish. Using the I/O model, the shift in landed product shows some interesting results (Table 265, Table 266, and Table 267).

The overall adverse impact on the Maine economy is roughly $8 million, while the overall positive impact on the Massachusetts economy is only $7.6 million. The primary reason for this is that the production functions embedded in the model assume that seafood landed in Portland is distributed more locally, while Gloucester has greater economic connectivity outside of Massachusetts and, in fact, outside of the New England region. The overall impact of such a shift on the New England region, consequently, is roughly -$0.3 million. This implies that some economic benefit resulting from the increased landings in Massachusetts are distributed outside of New England.

The model estimates that the overall impact on Maine incomes would be approximately -$3 million based on this upper-bound estimate. However, the overall impact on incomes within the New England region is positive ($142,000) under this scenario (Table 266). This is due to the model's estimates of productivity in the various sectors. Essentially, the model assumes that it takes fewer people to process seafood in Maine than it does in Gloucester and, consequently, more people are employed overall by the shift of product from one region to the other. Similarly, Table 267 shows a positive net impact on 7 jobs for New England as a whole while this hypothetical change would adversely impact 120 jobs in Maine.

Table 260 presents the estimated impacts on Maine (without the consequent impacts on Massachusetts or New England economies noted) in comparison to the contribution of all groundfish fishing, all fishing, and finally all commerce on the Maine economy. These estimates, which likely dramatically over-estimate the impacts as it is unlikely that *all* trips reported in areas 514, 521 and 522 would land their product in Gloucester in order to realize a gain of between five and 20 percent, clearly comprise a very small portion of the fishing economy in Maine. This is not to say that the consequences are insignificant as they are not. If certain business entities have production thresholds below which they cannot remain profitable, the I/O model does not incorporate the impacts of a total shutdown of that entity. With no data to evaluate such situations, however, no further conclusions may be drawn.

	Direct output impacts of vsl relocation	Total output impacts of vsl relocation	Total output impacts of groundfish overall	Total output impacts of all commercial fishing	Total output of local economy (all fishing and non-fishing related impacts)	Vsl relocation output impacts as a percent of all fishing impacts	Vsl relocation output impacts as a percent of all economic impacts
Maine	-$4.03	-$8.00	$63.24	$530.22	$42,949.49	-1.509%	-0.019%

Table 260 – Upper-bound estimates of potential impacts if all vessels fishing at least one trip in statistical areas 514, 521 and 522 relocate to Gloucester from Portland (in millions of dollars).

Steaming time for offshore versus inshore fishing trips

Steaming time is commonly thought to occupy a larger portion of an individual trip's dock-to-dock time for trips farther from shore than for those trips closer to shore. This hypothesis is tested for the Gulf of Maine and northern/central Georges Bank by comparing the percentage of time steamed for trips reporting less than 1.5 days absent and fishing in statistical areas 512, 513, 514 and 521 with trips reporting more than 1.5 days absent and fishing in statistical areas 515, 521, and 522 (see Figure 8 for statistical area locations). This methodology makes the assumption that fishing begins and ends at the point (latitude/longitude coordinates) reported on the vessel trip report. While this is obviously not an accurate assumption, no data exists to indicate if the assumption is individually biased for either group.

A t-test for two independent samples is conducted to test the hypothesis that the mean percent of steaming time is the same for both types of trips. Table 261 and Table 262 show that, for data with both equal and unequal variance, the probability of seeing these two data sets if the mean steaming time percentage were actually the same for the two trip types is less than .0001—or, very unlikely. Essentially, the mean steaming time is dramatically different between the two trip categories, with inshore trips spending a significantly greater percentage of their fishing time steaming than offshore trips.

When these data are viewed on a per-port basis, it is interesting to note that for both inshore and offshore trips, Portland has a lower steaming time percentage than either Gloucester or New Bedford. Chatham and Provincetown have the lowest average steaming times for both categories of trips. Table 264 converts the percentage of steaming time to a mean time per DAS used. For trips taken from a specific port, there is little difference between the amount of time spent steaming for each DAS used. Indeed, the values are remarkably similar with the exception of those for Provincetown (lower in all cases), Chatham (lower for offshore trips), and New Bedford (higher for inshore trips).

Variable	area	N	Lower CL Mean	Mean	Upper CL Mean	Lower CL Std Dev	Std Dev	Upper CL Std Dev
pct_stm	inshore	7184	0.1558	0.1583	0.1608	0.1057	0.1075	0.1092
pct_stm	offshore	1774	0.2119	0.2187	0.2256	0.142	0.1467	0.1517

Table 261 – Descriptive statistics for Inshore and offshore steaming time percentage data.

Variable	Method	Variances	DF	t Value	Pr > |t|
pct_stm	Pooled	Equal	8956	-19.61	<.0001
pct_stm	Satterthwaite	Unequal	2264	-16.31	<.0001

Table 262 – T-test results for Ho=*mean1=mean2*

	Offshore trips				Inshore trips			
	Mean value	Mean distance (nm)	Mean days absent	Mean pct_stm	Mean value	Mean distance (nm)	Mean days absent	Mean pct_stm
Chatham	$7,901	20.29	2.54	0.09	$1,893	18.53	1.07	0.19
Gloucester	$25,552	112.02	5.85	0.25	$2,086	22.86	1.05	0.22
New Bedford	$26,963	114.59	6.55	0.22	$10,678	66.35	1.2	0.59
Provincetown	$15,048	23.49	4	0.1	$2,175	11.53	1.04	0.11
Portland	$25,477	117.15	6.15	0.21	$1,606	28.66	1.04	0.28
Portsmouth	N/A	N/A	N/A	N/A	$772	28.28	1.07	0.27

Table 263 – Inshore and offshore steaming time percentages for various New England groundfish ports (source: prorated vessel trip reports).

	Offshore Trips		Inshore Trips	
	Mean Steaming Time (DAS)	Mean Time/DAS	Mean Steaming Time (DAS)	Mean Steaming Time/DAS
Chatham	0.2286	0.09	0.2033	0.19
Gloucester	1.4625	0.25	0.231	0.22
New Bedford	1.441	0.22	0.708	0.59
Provincetown	0.4	0.1	0.1144	0.11
Portland	1.2915	0.21	0.2912	0.28
Portsmouth	N/A	N/A	0.2889	0.27

Table 264 – Inshore and offshore mean steaming time per DAS used (source: prorated vessel trip reports)

	Downeast	Upper Mid-Coast	Lower Mid-Coast	Southern	NH Sea-coast	Gloucester	Boston	Cape & Islands	New Bedford	Rhode Island	CT Seacoast	Non-Maritime	New England
Sector	ME	ME	ME	ME	NH	MA	MA	MA	MA	RI	CT	NE	NE
Fishing: Inshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Offshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Bottom Trawl	0	0	-3,080,000	0	0	3,080,000	0	0	0	0	0	0	0
Medium Bottom Trawl	0	-17,000	-860,000	0	0	877,000	0	0	0	0	0	0	0
Small Bottom Trawl	0	0	-56,000	0	0	56,000	0	0	0	0	0	0	0
Large Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Surf Clam, Ocean Quahog Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Sink Gillnet	0	0	-16,000	0	0	16,000	0	0	0	0	0	0	0
Diving Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Midwater Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Pots and Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottom Longline	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Mobile Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Fixed Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Hand Gears	0	0	0	0	0	0	0	0	0	0	0	0	0
Agriculture	-1,122	-52	-110	-65	-35	-64	-135	-54	-18	-31	-610	-1,158	-3,452
Mining	0	0	0	0	0	-2	-13	0	0	0	-3	-10	-28
Construction	-11	-54	-202	-53	-283	-250	-1,427	-144	-170	-265	-866	-1,358	-5,083
Manufacturing	-6	-42	-259	-54	-316	-437	-1,981	-46	-246	-453	-1,651	-1,534	-7,025
Fresh and Frozen Seafood Processing	0	-1,356	-2,361,123	0	4,679	2,247,243	46	0	4,297	-151	0	0	-106,365
Manufactured Ice	0	0	0	0	-1	-7	-75	-6	-64	-34	-4	-44	-235
Cordage and Twine	0	0	0	0	0	0	0	0	0	0	0	0	-1
Paperboard Containers and Boxes	0	0	-166	-155	-125	-398	-859	0	-374	-620	-1,045	-2,714	-6,456
Transportation, Communications and Public Utilities	-11	-40	-328	-49	-508	-360	-3,019	-151	-255	-710	-1,926	-2,274	-9,631
Motor Freight Transport and Warehousing	-37	-49	-447	-48	-413	-274	-1,786	-65	-255	-470	-954	-2,228	-7,026
Water Transportation	-2	-8	-13	-1	-4	-13	-50	-26	-6	-17	-65	-7	-211
Trade	-17	-87	-471	-126	-694	-498	-2,880	-282	-385	-672	-1,682	-2,721	-10,514
Seafood Dealers	0	-916	-1,600,000	0	3,160	1,520,000	31	0	2,900	-102	0	0	-74,927
Wholesale Trade	-10	-46	-538	-67	-956	-701	-5,645	-84	-483	-695	-2,883	-3,206	-15,314
Finance, Insurance and Real Estate	-8	-58	-517	-66	-741	-679	-6,339	-232	-293	-871	-3,591	-4,342	-17,738
Services	-30	-159	-1,027	-199	-1,343	-1,230	-10,077	-444	-662	-1,752	-5,069	-6,455	-28,447
Government	-4	-16	-74	-16	-93	-92	-460	-28	-52	-106	-239	-489	-1,669
Other	0	-3	-5	-1	-4	-7	-34	-3	-2	-6	-32	-29	-126
Total	-1,258	-19,886	-7,977,280	-899	2,323	7,791,230	-34,703	-1,564	3,933	-6,955	-20,619	-28,569	-294,246

Table 265 – Total New England regional sales impacts from shifting selected product landed in Maine to Gloucester; an upper-bound estimate.

	Downeast	Upper Mid-Coast	Lower Mid-Coast	Southern	NH Seacoast	Gloucester	Boston	Cape & Islands	New Bedford	Rhode Island	CT Seacoast	Non-Maritime	New England

Sector	ME	ME	ME	ME	NH	MA	MA	MA	MA	RI	CT	NE	NE
Fishing: Inshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Offshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Bottom Trawl	0	0	-1,776,852	0	0	1,776,852	0	0	0	0	0	0	0
Medium Bottom Trawl	0	-7,276	-368,080	0	0	375,356	0	0	0	0	0	0	0
Small Bottom Trawl	0	0	-19,242	0	0	19,242	0	0	0	0	0	0	0
Large Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Surf Clam, Ocean Quahog Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Sink Gillnet	0	0	-8,523	0	0	8,523	0	0	0	0	0	0	0
Diving Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Midwater Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Pots and Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottom Longline	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Mobile Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Fixed Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Hand Gears	0	0	0	0	0	0	0	0	0	0	0	0	0
Agriculture	-159	-13	-23	-15	-9	-20	-42	-19	-7	-8	-212	-347	-874
Mining	0	0	0	0	0	-1	-4	0	0	0	-1	-3	-8
Construction	-6	-28	-110	-28	-163	-150	-871	-84	-100	-153	-533	-805	-3,033
Manufacturing	-1	-9	-63	-13	-81	-106	-554	-13	-60	-115	-473	-387	-1,877
Fresh and Frozen Seafood Processing	0	-213	-317,077	0	966	551,633	10	0	805	-30	0	0	236,094
Manufactured Ice	0	0	0	0	0	-3	-37	-3	-32	-17	-2	-21	-116
Cordage and Twine	0	0	0	0	0	0	0	0	0	0	0	0	0
Paperboard Containers and Boxes	0	0	-37	-30	-30	-74	-194	0	-83	-125	-255	-623	-1,451
Transportation, Communications and Public Utilities	-3	-11	-81	-11	-117	-88	-807	-34	-59	-167	-484	-540	-2,402
Motor Freight Transport and Warehousing	-11	-13	-139	-15	-129	-93	-588	-20	-83	-151	-331	-714	-2,287
Water Transportation	0	-1	-2	0	-1	-3	-14	-6	-1	-3	-15	-2	-50
Trade	-8	-42	-231	-59	-341	-241	-1,399	-136	-185	-323	-840	-1,335	-5,139
Seafood Dealers	0	-479	-836,751	0	1,653	794,914	16	0	1,517	-53	0	0	-39,184
Wholesale Trade	-4	-18	-208	-26	-369	-271	-2,181	-32	-186	-268	-1,113	-1,237	-5,912
Finance, Insurance and Real Estate	-2	-13	-132	-8	-140	-98	-1,419	-39	-49	-178	-813	-1,062	-3,953
Services	-14	-77	-535	-95	-685	-660	-5,843	-223	-346	-936	-2,854	-3,477	-15,746
Government	-1	-4	-28	-5	-35	-28	-203	-9	-17	-46	-97	-175	-647
Other	0	-3	-5	-1	-4	-7	-34	-3	-2	-6	-32	-29	-126
Total	-208	-8,201	-3,328,118	-307	514	3,524,676	-14,164	-621	1,110	-2,578	-8,057	-10,756	153,290

Table 266 - Total New England regional income impacts from shifting selected product landed in Maine to Gloucester; an upper-bound estimate.

	Downeast	Upper Mid-Coast	Lower Mid-Coast	Southern	NH Seacoast	Gloucester	Boston	Cape & Islands	New Bedford	Rhode Island	CT Seacoast	Non-Maritime	New England
Sector	ME	ME	ME	ME	NH	MA	MA	MA	MA	RI	CT	NE	NE
Commercial Fishing	Employment (jobs)												
Inshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Offshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Bottom Trawl	0	0	-61	0	0	61	0	0	0	0	0	0	0
Medium Bottom Trawl	0	0	-17	0	0	17	0	0	0	0	0	0	0
Small Bottom Trawl	0	0	-1	0	0	1	0	0	0	0	0	0	0
Large Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Surf Clam, Ocean Quahog Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Sink Gillnet	0	0	0	0	0	0	0	0	0	0	0	0	0
Diving Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Midwater Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Pots and Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottom Longline	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Mobile Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Fixed Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Hand Gears	0	0	0	0	0	0	0	0	0	0	0	0	0
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0	0
Mining	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction	0	0	0	0	0	0	0	0	0	0	0	0	0
Manufacturing	0	0	0	0	0	0	0	0	0	0	0	0	0
Fresh and Frozen Seafood Processing	0	0	-17	0	0	13	0	0	0	0	0	0	-4
Manufactured Ice	0	0	0	0	0	0	0	0	0	0	0	0	0
Cordage and Twine	0	0	0	0	0	0	0	0	0	0	0	0	0
Paperboard Containers and Boxes	0	0	0	0	0	0	0	0	0	0	0	0	0
Transportation, Communiztions and Public Utilities	0	0	0	0	0	0	0	0	0	0	0	0	0
Motor Freight Transport and Warehousing	0	0	0	0	0	0	0	0	0	0	0	0	0
Water Transportation	0	0	0	0	0	0	0	0	0	0	0	0	0
Trade	0	0	0	0	0	0	0	0	0	0	0	0	0
Seafood Dealers	0	0	-36	0	0	49	0	0	0	0	0	0	13
Wholesale Trade	0	0	0	0	0	0	0	0	0	0	0	0	0
Finanace, Insurance and Real Estate	0	0	0	0	0	0	0	0	0	0	0	0	0
Services	0	0	0	0	0	0	0	0	0	0	0	0	0
Government	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	-133	0	0	141	0	0	0	0	0	0	7

Table 267 – Total New England regional employment impacts from shifting selected product landed in Maine to Gloucester; an upper-bound estimate.