7.1.5.2 Other significant effects

7.1.5.2.1 Discard mortality

7.1.5.2.2 Caused by size-limit discarding

Size limits for monkfish, due to the size structure of the monkfish resource and the non-selectivity of most of the fishing gear in use, has the potential to cause significant discarding. Gear has not yet been developed U.S. to help fishermen capture only larger monkfish while retaining smaller target species. Some fishermen in Europe are required to use a grate in their trawls to separate large from small monkfish (see Appendix III), but this technology has not been used in the U.S. fishery for monkfish. Although research on finfish excluders in sea scallop dredges is now underway in the U.S., it is intended to separate large finfish from the catch of smaller scallops. Scallopers will, therefore, loose an important component of their landings by using the device. It will not be suitable for use when scallopers partially target monkfish during their scallop days-at-sea or when scallopers target only monkfish with beam trawls.

The primary focus of the size limit is to induce behavioral changes in the directed fishery, so that fishermen will fish less in areas where small monkfish are prevalent. The resource could also realize some benefits from the survival of discarded monkfish, but Section 11.6.6.1 suggests that gains will not be realized unless discard mortality is less than about 40 percent. Monkfish discard mortality is uncertain and no data on this exists for individual fisheries. Discard survival in limited studies ranged from 8 to 57 percent.

It is unknown how often fishermen will seek larger monkfish because of the size limit. Fishermen that target monkfish stand to loose a significant portion of their catch due to small size. Without regard to directivity, the percent of landings (by weight) between 11 inches (the current minimum size) and 14 inches (the proposed minimum size) that would be lost by fishermen given the age structure during 1992-1993 is: trawls - 40 percent, scallop dredges - 27 percent, and sink gillnets - 0.8 percent. Fishermen using trawls and dredges to target monkfish may seek larger monkfish to increase their retained catch relative to the amount of undersized monkfish and reduce costs.

In addition to affecting dockside prices (**see Section 7.1.6.1.2**), the minimum size limits will most likely cause discarding in traditional trawl, dredge, and gillnet fisheries. For example, if the size limits were in effect during 1994 and 1995, the peewee and perhaps half of the small market categories would have been discarded if landings in the small category were evenly distributed by size, amounting to approximately 15 to 20 million pounds of monkfish in live weight, or about 30 percent of actual landings. Discard mortality will delay stock rebuilding and future benefits.

7.1.5.2.3 Caused by trip or possession limits

The Alternative 1 and 3 trip or possession limits for vessels that target species other than monkfish were chosen to affect the fewest number of trips while, at the same time, acting as a disincentive for non-qualifying vessels to target monkfish. Discarding as a result of these limits should therefore be at an acceptable level that contributes to keeping mortality at reasonable levels. In general, the limits were chosen based on the landings history of vessels during 1991 to 1994. Less than one percent of trips where monkfish accounted for less than 15 percent of revenue would be affected by the proposed limits. Less than 10 percent of trips in each fishery (defined by area, gear, and target species) would be affected by the proposed limits. These limits would affect a much greater proportion of total monkfish landings, because trips that partially or exclusively targeted monkfish would not be able to occur under the proposed action. Some vessels that previously landed these high-volume monkfish trips will qualify for monkfish limited access and some of these trips could still occur under a quota or days-at-sea based management program. Other vessels would no longer be able to target monkfish and would have to target other species.

Non-preferred alternative 4 has more restrictive limits than do alternatives 1 and 3, since the limits were chosen to achieve a desired allocation for the limited access fishery. The lower trip or possession limits (175 or 200 pounds per day-at-sea) may, in some fisheries, cause unacceptably high discarding while the vessels pursue species other than monkfish (groundfish, sea scallops, summer flounder). Since discard survival is thought to be low, the gains from growth are not likely to overcome the losses from discard mortality.

The amount and frequency of discarding as a result of the proposed trip or possession limits is explained in greater detail in Section 7.1.5.1.1.5.

7.1.5.2.4 Changes in fishing behavior

The proposed action will not be effective unless it changes fishing behavior. Little change in fishing behavior is expected in fisheries that target species other than monkfish. Some vessels that currently target monkfish, however, will have insufficient history, either due to their entry into the fishery after the control date or because they simply did not fish very frequently for monkfish during the qualification period, to qualify for limited access. These vessels will have to return to the type of fishing they had previously conducted or they will have to seek opportunities in other fisheries.

Vessels that qualify for monkfish limited access may not have the same opportunity to fish for monkfish as much as they did in the past. The proposed management program could shorten their season, either by a seasonal quota or by annual day-at-sea allocations. If the management program to reduce monkfish mortality shortens their season, these vessels will also have to target other fisheries or remain at the dock until the monkfish season re-opens.

The proposed size limits will substantially affect the proportion of monkfish catch that fishermen may land. It is impossible to estimate how frequently the size limit will induce fishermen to target monkfish in areas where large fish are more prevalent. Some of the losses will be recouped by gains due to the growth of survivors while the resource could realize other benefits by the redirection of effort onto larger fish. The Councils expect these two factors to produce net positive benefits to the resource and the fishery.

7.1.5.2.5 Long-term productive capability of the stocks

7.1.5.2.5.1 Monkfish

A predictive model for monkfish that gave plausible results could not be developed because of poor understanding of stock dynamics at that level of detail. The Monkfish Technical Workgroup, a precursor to the PDT, attempted to model the monkfish population via a length-based transition model. The models and various assumptions gave unreliable results or required unreasonable assumptions. Back-testing of the model could not reproduce the survey biomass observations when past fishing mortality and recruitment levels were applied. The Technical Workgroup concluded that data were insufficient to provide reliable estimates of future yield by applying the catch equation and various assumptions about natural mortality, survey catchability, growth rates, and recruitment.

As a rough approximation of future yields, the PDT decided to project recent changes in biomass into the future to calculate the expected yield for the No Action alternative. This approach was taken in lieu of a more comprehensive model that takes into account current age structure, exploitation patterns, and average recruitment. In the Northern Fishery Management Area, yield for the No Action alternative is expected to decline from 12,739 mt in 1995-1996 to 5,628 mt in 2018, 20 years after the implementation of the Monkfish FMP. Yield would decline from 14,667 mt in 1995-1996 to 10,559 mt in the Southern Fishery Management Area..

For the preferred alternative, the PDT assumed the future yield from the TAC plan objectives until 2005 and then from the anticipated 10-year rebuilding objective. The yield associated with relative biomass rebuilding targets (2.91 kg/tow in the north, 1.87 kg/tow in the south) was estimated by calculating a ratio between the research survey weight per tow and the commercial yield, accounting for changes in fishing mortality. For the preferred alternative, the Councils expect the yield from the Northern Fishery Management Area to decline from 12,739 mt in 1995-1996 to 4,047 mt in 2004, followed by a rebound to 10,739 mt when the stock is rebuilt. In the Southern Fishery Management Area, the Councils expect the yield to decline from 14,667 mt in 1995-1996 to 2,224 mt in 2004, followed by 32,235 mt when the stock is rebuilt.

Stochastic methods were applied to estimate uncertainty in the projections from the variance of the input parameters. These projections, however, may represent but do not directly account for recruitment variability or changes in mean size at age. These projections are rough estimates of future yield, in lieu of an age-based or length-based population model that would estimate the probable stock response to reduced fishing mortality. The projections presented below assume that biomass remains constant throughout the mortality reduction phase (or that fishing mortality increases if biomass declines, or vice versa) and then rebounds with a slight decrease in fishing mortality (for the southern area only) to target levels. Whenever sufficient data or methods allow, future monkfish projections should be based on other methods than those used here.

The projected yield for the preferred alternative and the No Action alternative were used to estimate the net economic benefits or costs in Section 7.1.5.2.5.1.1.

7.1.5.2.5.1.1 Yield forecast for the preferred alternative

The expected landings for the preferred alternative were estimated by adjusting the TAC objectives for additional regulatory discards caused by the new management measures and for the changes in discards expected from day-at-sea changes in the multispecies and scallop fisheries. The increased regulatory discards were deducted from the TACs, because the additional discards would come at the expense of yield. In the Northern Fishery Management Area, the discard deductions were 246 to 250 mt in the first three years, increasing to 2,007 mt (Table 94) when no days-at-sea allocations are planned. The discard deductions in the Southern Fishery Management Area were 419-425 mt in the first three years, followed by 1,184 mt in regulatory discards (Table 95) when no monkfish days-at-sea are allocated. On the other hand, future declines in multispecies and scallop days would contribute to decreases in discarding that could be translated into landings. This management change is expected to contribute 333 to 484 mt to future landings in the northern area and 236 to 285 mt in the southern area.

After mortality is reduced to target levels and the stock is expected to rebuild, the monkfish yields are expected to increase to a level consistent with the stock biomass targets and target exploitation rates. The Councils assumed that stock biomass and yield will increase linearly from the time that overfishing stops in year 4 to when the stock is rebuilt in year 10 (Figure 44). The shape of the recovery is however uncertain. It could be delayed by continuing biomass declines during the mortality reduction phase of the FMP, or stock rebuilding could occur earlier than expected if the reference points are more conservative than necessary to allow stock rebuilding. The Council believes that its assumption is the best compromise between these two possibilities and should be used to project yield until a more analytical approach is possible.

Relating current yield to the survey biomass observations was necessary to estimate future yield when the stock is rebuilt. This was accomplished by a simple modification to the traditional catch equation:

$$Y = C * \overline{w} = N \, \overline{w} e^{-Z} \left(\frac{F}{Z} \right) r \qquad \textbf{Equation 1}$$

where: N = number of fish caught
w = mean weight of fish caught
F = fishing mortality
Z = total mortality

r = ratio of commercial landings to the yield predicted by applying the fishing mortality rate to survey biomass.

Changes in this ratio, embedded in the equation above, are a measure of the relationship between landings and fishing mortality. Changes are due to decreased discarding of monkfish bycatch because of improving markets and increased official landings due to improvements in data collection and fewer fish being landed outside normal markets (i.e. ones more likely to report). Both factors have undergone considerable change over the history of the monkfish fishery.

This ratio of landings to calculated yield can be estimated by rearranging Equation 1:

$$r = \frac{Y}{be^{-Z}\left(\frac{F}{Z}\right)}$$

Equation 2

where: Y = reported landings
b = mean survey weight per tow
F = estimated fishing mortality from NEFSC (1997).

Given the factors that would contribute to the value of the ratio, it is not surprising that the ratio between yield and the survey weight per tow changed substantially since 1967. During 1992-1996, the average ratio in the Northern Fishery Management Area was 23,706, a 40-fold increase over the ratios calculated for 1967 to 1973. In the Southern Fishery Management Area, the ratio for 1992-1996 was 69,818, a 630-fold increase over the ratios calculated for 1967 to 1973. The larger difference in the southern area could reflect the magnitude of foreign catches of monkfish, although reported foreign catches were low, usually less than 100 mt.

The Councils assumed that the 1992 to 1996 ratio would remain constant in the future and applied the target mortality rate and target biomass to estimate future yield for the rebuilding phase of the preferred alternative. To account for some sources of uncertainty associated with discarding and reporting, the Councils also calculated the predicted yields assuming a normal error structure with a standard deviation equal to the one standard deviation for the 1992 to 1996 catch ratios described by Equation 2. Five hundred samples were drawn from the estimated variation in the catch ratio via Latin hypercube re-sampling to estimate probability distributions for future yields. Expected landings through 2004 were assumed to be known without error, because they are specified by the FMP. In lieu of an analytic population model to predict rebuilding, the PDT assumed a linear increase in landings and stock biomass until management achieved the target in 2009.

With a target mortality rate equal to 0.05 and a target biomass level of 2.44, the median expected yield when the stock is rebuilt in the Northern Fishery Management Area is 10,700 mt (Table 117). Including the variation in the catch ratio, the future landings at the rebuilding targets is estimated to have an 80 percent probability of being between 8,600 and 12,900 mt (Figure 44).

The predicted yield associated with a rebuilt stock in the Southern Fishery Management Area is 32,200 mt (Table 117). This result is based on a target fishing mortality rate of 0.1, a target survey biomass level equal to 2.94 kg/tow, and a catch ratio of 62,692. Accounting for the uncertainty in the catch ratio (error in discards and unreported landings), the future landings when at the rebuilding targets is between 25,400 and 39,000 (Figure 45).

Compared with the status quo (Section 7.1.5.2.5.1.2), the median estimates are 5,100 and 21,700 mt higher for the preferred alternative in the northern and southern areas, respectively. The larger difference in the southern area is attributable to the larger area and potential biomass and the more depleted condition of the resource. In the northern area, biomass has increased due to recent recruitment, although the biomass is composed of mainly young monkfish. In the southern area, the survey biomass is at time-series low value. These target yield estimates and the projections of yield during the rebuilding phase are the inputs used to estimate net benefits in Section 7.1.6.

Table 117. Comparison between the No Action alternative (status quo) and the preferred alternative for projected median landings and total allowable catch. The No Action alternative is projected based on the average annual decline in total stock biomass between 1992 and 1997. The FMP projection represents the total allowable catches that correspond with the FMP's mortality reduction objectives, with recovery of stock biomass to B_{target} conditions, equivalent to 2.44 kg/tow in the Northern Fishery Management Area and 2.94 kg/tow in the Southern Fishery Management Area.

Calendar year	Fishing year (begins May 1)	Median expected landings (mt) – No Action		Median expected landings (mt) - Preferred alternative	
		North	South	North	South
1995-1996 baseline		12,739	14,667	FMP projection	
Annual percent change (1992 – 1997)		-3.7%	-1.7%		
1999	1	11,396	14,024	5,673	6,024
2000	2	10,981	13,816	5,673	6,024
2001	3	10,581	13,611	5,673	6,024
2002	4	10,195	13,410	5,673	6,024
2003	5	9,823	13,211	4,047	3,252
2004	6	9,465	13,015	4,047	2,224
2005	7	9,120	12,822	5,385	8,226
2006	8	8,788	12,632	6,724	14,228
2007	9	8,468	12,445	8,062	20,231
2008	10	8,159	12,260	9,400	26,233
2009	11	7,862	12,078	10,739	32,235
2010	12	7,575	11,899	10,739	32,235
2011	13	7,299	11,723	10,739	32,235
2012	14	7,033	11,549	10,739	32,235
2013	15	6,777	11,378	10,739	32,235
2014	16	6,530	11,209	10,739	32,235
2015	17	6,292	11,043	10,739	32,235
2016	18	6,062	10,879	10,739	32,235
2017	19	5,841	10,718	10,739	32,235
2018	20	5,628	10,559	10,739	32,235

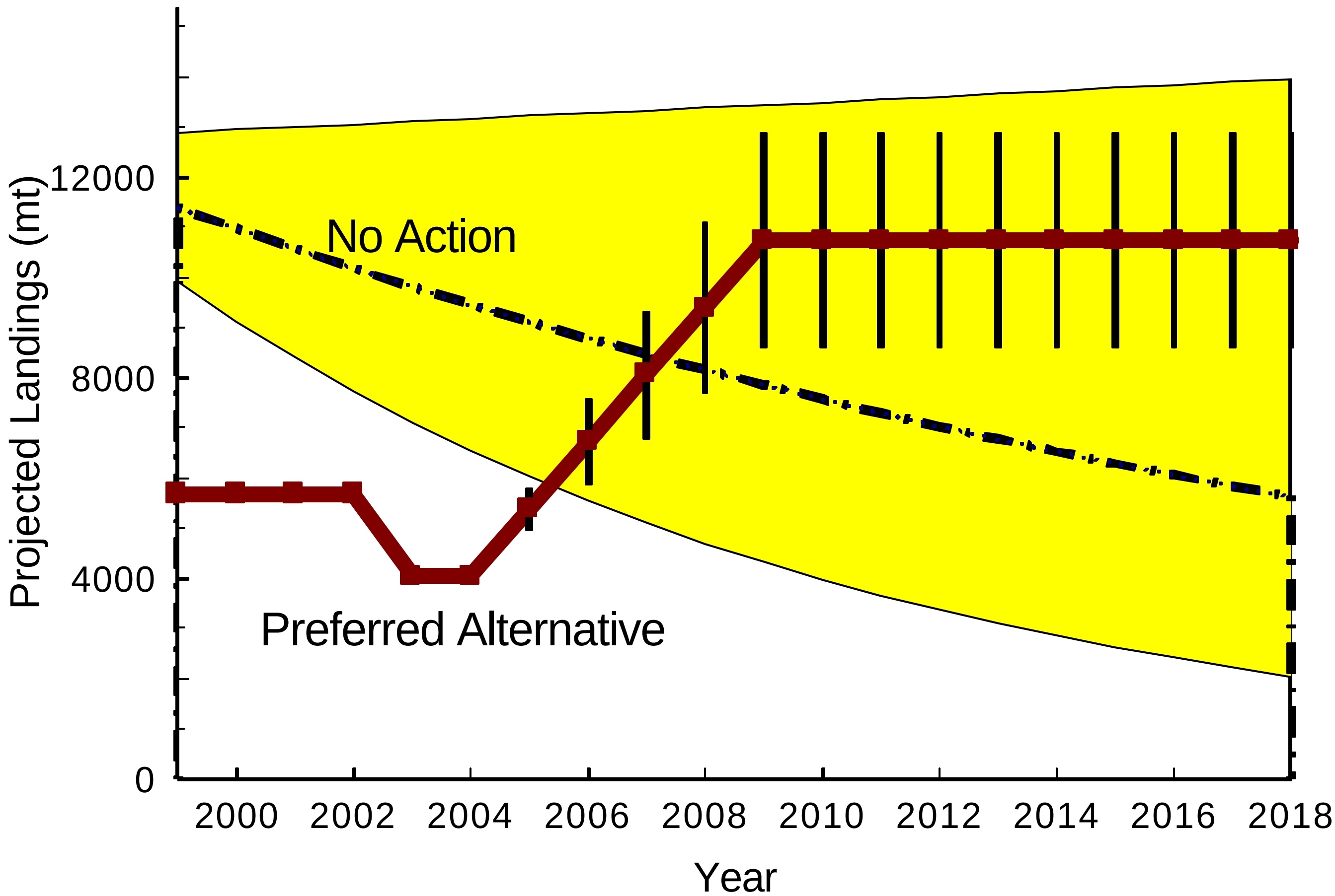

Figure 44. Northern Fishery Management Area: Projected monkfish landings for the No Action (dotted line) and preferred alternatives (heavy solid line). The shading around the No Action estimates and the vertical bars around the Preferred Alternative represent the 80th percent confidence interval derived from the uncertainty in the input parameters.

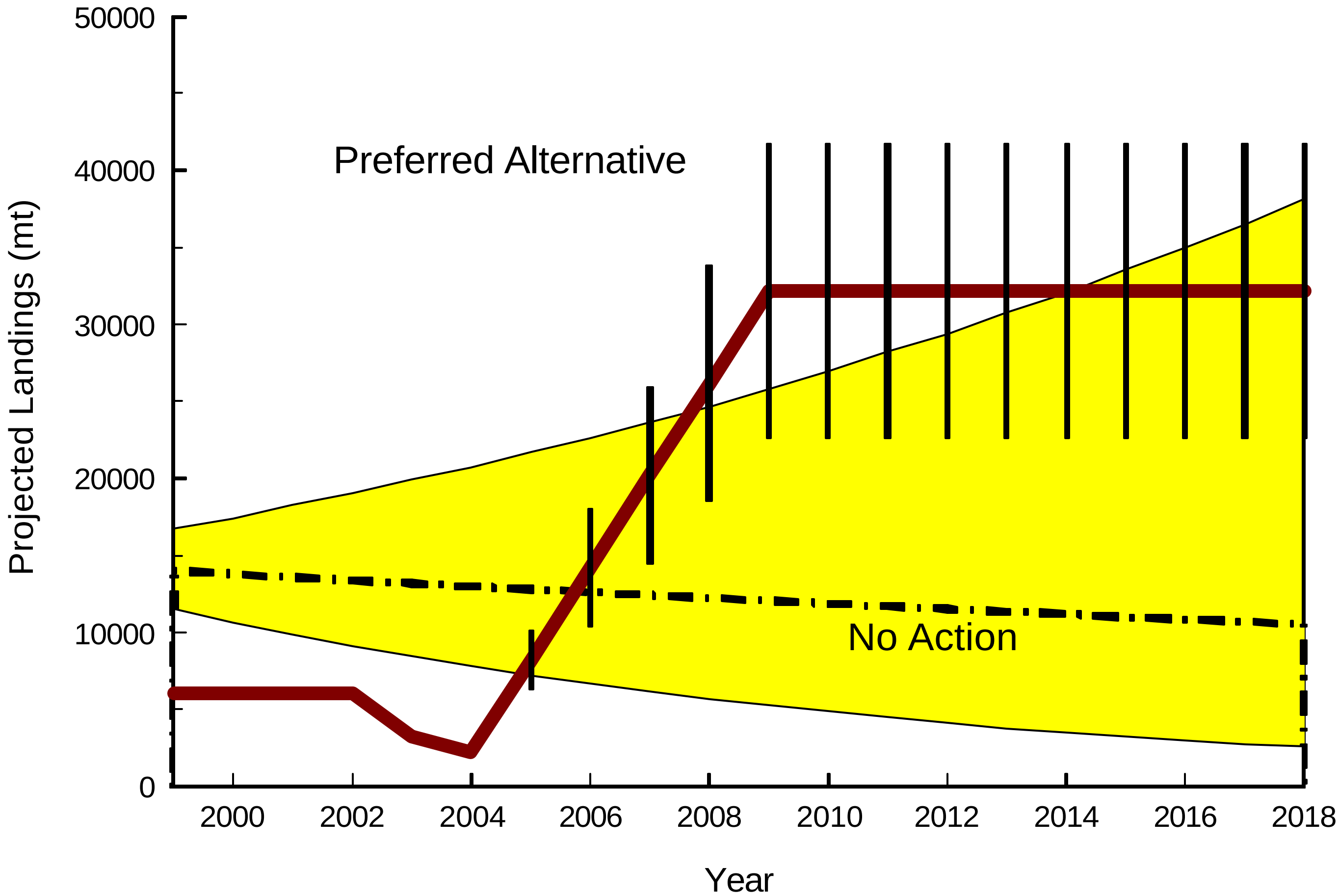

Figure 45. Southern Fishery Management Area: Projected monkfish landings for the No Action (dotted line) and preferred alternatives (heavy solid line). The shading around the No Action estimates and the vertical bars around the Preferred Alternative represent the 80th percent confidence interval derived from the uncertainty in the input parameters.

Length-structured analytical model

A more analytical approach for predicting future stock size and yield was attempted by the Council, but the recent stock data that was entered into the model gave unreliable predictions. In the Northern Fishery Management Area, the model predicted that stock rebuilding from current levels was impossible, even if fishing mortality was zero. In the Southern Fishery Management Area, the model predicted that rebuilding was possible even at current fishing mortality levels. Unreasonable assumptions about the relative efficiency of the dredge to capture small monkfish in the two areas or about differences in natural mortality had to be made to obtain plausible results from the model.

The Monkfish Technical Working Group developed a length-based population projection model to assess the implications of various management measures for stock rebuilding. The model used a von Bertalanffy growth equation to define an annual growth increment for each length category. The length frequency distribution in any given year consists of individuals which grew into the defined length range plus those that remained there (i.e., the computed growth step was less than a unit interval) and minus those that grew out of the range. A ?from-to? projection matrix identifies the starting length class in year t and the final length class in year t+1. The probability of surviving between year t and t+1 is modeled using usual exponential model for population decay and estimated catches are based on the classic catch equation. Recruitment can be handled in a variety of ways but for testing purposes recruitment was treated as constant vector of numbers by length category over the range xx to yy, corresponding to lengths for zz year old monkfish. Growth parameters and size-specific partial recruitment rates, baseline fishing mortality rates were allowed to vary by stock area.

The model is considered to be an accurate depiction of the current level of knowledge of monkfish population dynamics and the fishery. Several hypothesized mechanisms of population regulation, such as cannibalism or size-dependent natural mortality rate were not included owing to a lack of data. Such mechanisms may motivate innovative research or stimulate interesting theoretical advances but until their inclusion can be quantified, they have limited utility for management.

The Monkfish Technical Working Group initially hypothesized that the abundance levels and length frequencies observed during the 1970-79 period were characteristic of a stable period of abundance and mortality. The projection model provided a means of testing whether the estimated growth and mo rtality rates are consistent with this hypothesis. Lack of consistency would be evident if the projected population size structure failed to match the observed frequencies or if the overall population reached an equilibrium level significantly different from the target levels. Disagreement between observed and predicted could be induced by mis-specification of recruitment, growth rates, natural mortality, fishing and discard mortality, or some combination of these factors. Initial runs of the model for northern and southern stocks indicated that the projected northern population would decline from the 1970-79 baseline period, whereas southern stocks would increase. This suggested that different types of mechanisms might be involved and/or the direction of change for a given parameter might be different for these stock areas.

One option initially explored was the possibility that size dependent partial recruitment patterns and discard rates may be responsible for the divergences. Since actual catches (i.e., landings plus discard) were poorly estimated, changes in the magnitude of mortality on smaller individuals might be responsible. Projection runs suggested relatively little influence of this mechanism on the equilibrium population size structure in either area. Sensitivity analyses with respect to growth rates also had limited effect.

Discussions within the PDT began to focus on the possibility of modifying the magnitude of recruitment and natural mortality rate. The first mechanism implies a difference in selectivity of the survey for small versus large monkfish. Varying selectivity of the dredge by habitat area could explain differences between northern and southern regions. The northern area is characterized by rocky substrate known to be desirable monkfish habitat. Moreover, the NEFSC trawl may be less efficient in such areas. Thus estimates of abundance may be underestimated in northern areas relative to southern areas. The second mechanism implies that the longevity of monkfish may exceed current estimates. The inverse relationship between longevity and natural mortality rate is well known in fish stocks. Therefore, the possibility existed that natural mortality rates could differ. Of course both recruitment levels and natural mortality rates could be mis-specified and a series of simulation experiments were conducted to explore these options.

Simulation experiments suggested that stability for the northern populations could be obtained by increasing the number of one-year old recruits by 50% and decreasing natural mortality from 0.2 to 0.07. Stability was defined as a stable population within 10% of the 1970-79 target. In the south, stability was achieved by reducing average recruitment for the effect of a pulse of year classes in early 1970's. This pulse, although evident in both the fall and spring NEFSC surveys, ultimately failed to materialize as a significant increase population biomass. Therefore, exclusion of these data seemed plausible. A slight reduction of natural mortality to 0.17 was also required.

Collectively, the necessary changes in parameterization implied an inadequate understanding of the dynamics of the stocks. Since the derived conditions for stability were not unique (i.e. other combinations of changes also could achieve stability) and since the scientific basis for such differences was weak, the PDT judged the current understanding of monkfish population dynamics to be inadequate for population projection. At the present time, the expected temporal for restoration of the stock to 1970-79 levels cannot be reliably predicted.

7.1.5.2.5.1.2 Yield forecast for the No Action (status quo) alternative

In lieu of a better predictive model of changes in future stock biomass and yield, the best approximation is to project recent trends in biomass, reflecting recent recruitment, fishing mortality, and exploitation patterns. Recent trends, however, are affected by the choice of time period, the choice of the size of fish in the biomass index, and recruitment. This approach assumes that fishing effort remains constant and catch per unit effort declines at the same rate as stock biomass, ignoring any potential changes in fishing technology.

Landings in both areas have increased during the early to mid-1990s to about 12,000 to 15,000 mt (Figure 2). In the Northern Fishery Management Area, landings were 6,000 to 10,000 mt in the early 1990s and then jumped to 14,000 to 15,000 mt in 1995 and 1996. This jump in landings is attributable to recent good recruitment and the effects (increased monkfish fishing effort) of Amendment 7 to the Multispecies FMP. Until the most recent survey estimate, stock biomass in the northern area had been increasing, despite the high exploitation level. In the Southern Fishery Management Area, landings peaked at 15,000 mt in 1993 and have been slowly declining since then to 12,500 mt in 1997. Low recruitment has been evident in the southern area survey abundance during the 1990s.

The Council examined three time periods and two length classes to estimate recent trends in stock biomass (Table 118). The period 1992-1997 reflects current conditions when the fishery began targeting monkfish more frequently, possibly converting discards to landings due to improved prices for livers and tails. The period 1986 to 1997 was considered because it reflected a longer trend that had been observable in the survey data. The third time period excluded 1986, because that year had high biomass observations that may be attributable to interannual variability in the survey measurements of biomass. Total and exploitable biomass trends were also examined to estimate future trends. Total biomass includes all monkfish captured by the survey trawl. Exploitable biomass includes all monkfish greater than 42 cm, a size that would yield a legal 11-inch tail. The threshold for this size class is larger than the true exploitation pattern, because smaller fish may be landed in some important states and smaller fish are often discarded (Figure 37 and Figure 38).

The Councils calculated the mean annual percentage change in biomass as the slope of the time series divided by the average biomass during the time series. The total biomass trend for the Northern Fishery Management Area declined by 3.7 percent per year during 1992-1997 (Table 118), while exploitable biomass increased by 0.6 percent. The difference is due to recruitment of recent good year classes into the exploitable size range. Very recent recruitment in the northern area has been poor and contributes to the larger decline in total biomass since 1992. Since 1986, total biomass has been declining at a 4.9 percent per year rate, while exploitable biomass declined by 6.2 percent. The rates for this period may overestimate the trend, because of the high biomass levels observed in 1986. Without 1986, the trends in total and exploitable biomass were -1.7 and –1.4 percent per year, respectively.

For all time periods, the decline in exploitable biomass has been steeper than for total biomass. For the southern area, total biomass declined by 1.7 percent per year during 1992-1997 (Table 118), while exploitable biomass declined by 2.7 percent per year. Over the longer period, total biomass has declined by 0.2 percent per year since 1986, but total biomass has increased by 0.5 percent per year when 1986 is excluded. Exploitable biomass has declined for all time periods examined, however, declining by 3.2 percent per year since 1986 and 2.1 percent per year since 1987.

After carefully examining the results, the PDT recommended projecting future yield using the trends in total survey biomass since 1992. That choice was made because the recent period was a better estimate of the effects from status quo exploitation and recent recruitment. The PDT recommended using total biomass, rather than exploitable biomass, because total biomass included recent recruitment conditions and also measured the effect of discard mortality. Variability in the biomass trend was estimated by assuming a normal error term for the residuals and resampling the assumed error distribution 500 times by Latin hypercube methods. For each iteration, the trend in the re-sampled annual biomass indices was re-estimated to project future landings. Some of these realizations produced a positive slope because the random errors were mainly positive for 1992 and 1993 and negative for 1995 and 1996. The method overstates variance the true trend estimated by linear regression during 1992 to 1996, but probably compensates for the uncertainty in future recruitment.

Using the 1992-1997 trends in total biomass, the Councils projected future status quo yield based on recent trends. This approach assumes that fishing effort remains constant and catch per unit effort declines at the same rate as stock biomass, ignoring any potential changes in fishing technology or the exploitation pattern. In the Northern Fishery Management Area, yield is expected to decline by 3.7 percent per year for status quo conditions (Table 118).

Northern Fishery Management Area landings would decline from 12,739 mt in 1995-1996 to 11,396 mt at the start of the monkfish management program in 1999 (Table 117). In twenty years, yield is expected to decline to only 5,628 mt under the status quo. Accounting for the uncertainty in the biomass trend, there is an 80 percent probability that landings would be between 2,000 and 14,000 mt in 2018 (Figure 44). About 25 percent of the re-sampled residuals resulted in a positive slope and therefore higher yield in 2018 than occur at present. Mortality reductions caused by declining days-at-sea in the multispecies and scallop fisheries could have some positive impacts that have not been taken into account, however.

Projecting the 1.7 percent annual decline in biomass into the future, the Southern Fishery Management Area yield in 1999 would be 14,024 mt and decline to only 10,559 mt in twenty years for the No Action alternative (Table 117). Accounting for the uncertainty in the biomass trend, there is an 80 percent probability that 2018 landings would be between 2,600 and 38,200 mt. Since recruitment during the late 1980s and early 1990s was very low, a 38,000 mt yield might be reasonable for the Southern Fishery Management Area if future recruitment improves. This outcome, however, ignores the relationship between spawning stock biomass and recruitment. At low spawning stock biomass levels, above-average recruitment is probably less likely than indicated by the current projection methodology. According to these projections, there is a nearly 40 percent probability that stock biomass would increase with the No Action alternative.

Table 118. Time-trend regression on NEFSC autumn survey biomass (kg/tow).

	North		South	
1992 to 1997	Total	Exploitable	Total	Exploitable
Slope	-0.041	0.007	-0.008	-0.011
Intercept	2.415	1.001	0.749	0.735
Mean annual percent change	-3.7%	0.6%	-1.7%	-2.7%
1987 to 1997				
Slope	-0.019	-0.018	0.002	-0.009
Intercept	1.724	1.798	0.414	0.683
Mean annual percent change	-1.7%	-1.4%	0.5%	-2.1%
1986 to 1997				
Slope	-0.061	-0.087	-0.001	-0.014
Intercept	3.054	3.936	0.516	0.848
Mean annual percent change	-4.9%	-6.2%	-0.2%	-3.2%

7.1.5.2.5.1.3 Yield forecast for non-preferred alternatives

The predicted yield for the non-preferred alternatives are exactly the same as for the preferred alternative. There are no differences in the mortality reduction schedule, the TACs associated with them, or in the ability of the framework adjustment process to meet the mortality objectives. Other mortality reduction schedules that the Councils considered were incompatible with the SFA requirements and were therefore rejected. Other mortality reduction schedules that stopped overfishing sooner than year 4 were believed to create too much economic and social disruption and would not meet the needs of the fishing communities while rebuilding stock biomass.

Even if a more conservative approach were possible, the Councils' PDT could not develop a projection model that gave realistic results for both stocks. A quicker schedule would, therefore, achieve rebuilding in seven to nine years rather than ten years. In the preferred alternative, the catch increases are simply a linear interpolation between the TAC in year 4 and the expected catch in year 10 when stock biomass would recover to the target level. For more conservative options, the year 1 catch would have to decline to 4,047 mt in the northern area and 2,024 mt in the southern area. Assuming the same biological response was assumed for the preferred alternative would indicate that stock biomass could reach target levels (and therefore the proxy for MSY) in year seven.

7.1.5.2.5.2 Groundfish

There may be some detrimental impacts on the rebuilding schedule for regulated groundfish stocks caused by the proposed restrictions on monkfish effort. Many vessels with multispecies limited access permits did not fully utilize their annual allocation of days during 1994, 1995 and 1996. During 1994 vessels with individual day-at-sea permits used 78 percent of their allocations, fleet vessels used 30 percent. During 1995, the proportion of days-at-sea used were 80 and 25 percent, respectively. These ratios rose to 82 percent for individual days-at-sea vessels and 29 percent for fleet days-at-sea vessels in 1996 due to the decreased allocation to 139 multispecies fleet days. In 1998, when the fleet allocation of multispecies days-at-sea is expected to be only 88 fleet days (and an equivalent amount of individual days), the proportion of days used to target multispecies is expected to increase to 90 percent for vessels with individual days and 37 percent for vessels with fleet days (MMC 1997).

Many vessels did not fish their full compliment of multispecies days-at-sea because they had not fished that often in the past or there were other fishing opportunities, like monkfish. If the opportunity to fish for monkfish is restricted by the proposed action, or the returns from fishing for groundfish become greater than those from fishing for monkfish, then these vessels may increase their utilization of multispecies days. If this occurs, the mortality rates on groundfish will rise, hampering the rebuilding program for groundfish.

Unlike the some of the non-preferred alternatives, the preferred alternative does not have the potential for shifting effort back into the multispecies program. Multispecies and scallop vessels that qualify for monkfish limited access would be allowed to use a portion of their existing annual days-at-sea allocations to target monkfish. If monkfish becomes more lucrative than groundfish or scallop fishing, then the preferred alternative may even relieve fishing pressure on those overfished stocks. Vessels that currently do not use their full complement of days-at-sea would use a greater proportion of them because they would be counted when the vessel targeted monkfish.

Increasing biomass of monkfish may also have negative repercussions due to predation on groundfish. Some groundfish species account for a significant fraction of the diet of monkfish. Atlantic cod (Gadus morhua), red hake (Urophycis chuss), and silver hake (Merluccius bilinearis) account for 22.4 percent of the monkfish diet by volume (Armstrong 1987), but only cod is a target of the multispecies rebuilding plan. By frequency of occurrence, groundfish species rank much lower in the observed diet of monkfish. Atlantic cod only account for 0.6 percent of the diet by number of animals. Haddock (Melanogrammus aeglefinus) and yellowtail flounder (Limanda ferruginea) did not appear in the diet, although this may be a function of where the samples were taken. For example, the gulf stream flounder (Citharichthys arctifrons) contributes to 2.4 percent of the gut contents, by number, indicating that monkfish could prey on yellowtail flounder if they happened to be available. No estimates are available on the total predation by monkfish on groundfish stocks.

7.1.5.2.5.3 Other species

Due to their opportunistic feeding habits, monkfish prey on a wide variety of other species. Red shrimp (Dichelopandalus leptocerus), sand lance (Ammodytes sp.), and long-finned squid (Loligo pealeii) account for 36 percent of the monkfish diet, by number (Armstrong 1987). With the exception of long-finned squid, these species are not a component of significant commercial or recreational fisheries. Due to this diet composition, monkfish appear to be more of a competitor of, rather than a predator on, other commercially- or recreationally important, piscivorous species.

7.1.5.2.6 Damage to ocean and coastal habitats

Habitat damage by fishing activity is being evaluated by the Councils to meet the essential fish habitat requirements of the Sustainable Fisheries Act. Once these and other anthropomorphic impacts have been identified and prioritized, the Council will be amending this plan to identify essential fish habitat and possibly define activities within them that would have deleterious effects and should be prohibited or curtailed. A generalized description of the effects of monkfish fishing is given below, but these descriptions will be updated by a future amendment for essential fish habitat.

7.1.5.2.6.1 Physical

Habitat damage caused by fishing for monkfish is similar to the physical effects of trawling for multispecies and dredging for sea scallops. Studies of changes in micro-habitat and reductions in biodiversity as a result of fishing activity are numerous (Jones 1992, Messeieh et al. 1991, Hutchings 1990, Sainsbury 1987). Due to the complexity of ecological interactions, however, it is more difficult to show negative consequences on a given species from fishing on another. Negative consequences have been shown by Wenner (1983) and Sainsbury (1987) in areas having a very fragile structure. In other areas, the consequences have been inconclusive or positive (ICES 1988, Arntz and Weber 1970, Medcof and Caddy 1971, Caddy 1973). Even though productivity for a species of interest may increase, however, biodiversity almost always declines in the face of fishing activity that alters the seabed. A broader discussion of the effects of trawling in the northeast multispecies fishery is given in Section 6.4.4.1 of the SEIS for Amendment 5 to the Multispecies FMP. Russell (1997) gives an overview of the damage often caused by trawling and the possible consequences of this activity.

Dredging generally results in greater physical alteration of the seabed than does trawling, due to the increased weight of the gear and its action of 'cutting' into the seabed to lift scallops into the dredge. Micro-habitat is often buried in the path of the dredge and the activity causes suspension of sediments (Caddy 1968). Direct effects of fishing activity often depend, however, on the spatial and temporal overlap of a given species and the one being fished (Roddick and Miller 1992). A more in-depth discussion of the physical impacts caused by dredging is given in Section VI.E.1 of the SEIS for Amendment 4 to the Atlantic Sea Scallop FMP.

Physical damage from fishing for monkfish may be less than that using similar gears to target multispecies and sea scallops, however. Unlike the multispecies trawls, monkfish gear does not have large rollers that might allow benthic-dwelling monkfish to evade capture. "Cookies" (rubber donuts made from disposed tires) are attached by fishermen on the footrope, but the gear is lighter and sweeps closer to the bottom. The wings, however, are typically wider than the standard groundfish trawl. No studies of damage caused by roller gear in the northeast are available, but they have been shown to cause considerable damage in more fragile habitats (Wenner 1983).

Due to this change and the reduced sedimentation (partly caused by a chain bag), the effects of monkfish beam trawls should be less than it is for a typical scallop dredge. Since the Regional Administrator and the Council classified scallop dredges as small mesh, scallopers began using beam trawls (i.e. modified scallop dredges with mesh, rather than chain, bags) to target monkfish. Use of this gear would not be prohibited by the proposed action, providing that fishermen use legal mesh. When targeting monkfish, fishermen often re-configure the cutting bar and lengthen the shoes so the dredge digs into the bottom less than it does when fishing for scallops.

Gillnets, because they are anchored, probably do less physical damage to the seabed and micro-habitats. Anchored monkfish gillnets lie along, but do not dig into, the seabed. Anchors help hold the gear to the bottom but the physical disturbance is minimal.

7.1.5.2.6.2 Ecological

The potential ecological damage caused by the proposed action would be caused by damage to habitat, changes in predation by monkfish and the spawning productivity of monkfish (as a food source for other species), and the direct bycatch of other species in the directed monkfish fishery. The degree of significant effects from these mechanisms is not estimable because of complex interactions and/or lacking data.

The future bycatch of other species in the monkfish fishery is uncertain. Changes in the number and type of vessels that target monkfish will occur, due to the proposed qualification criteria. How much and what species the activity encounters will depend on unpredictable changes in fishing behavior, the areas for monkfish effort that would be exempt from the multispecies days-at-sea regulations, and the number of days-at-sea available to target monkfish. The total number of days-at-sea used to target monkfish will depend on the status of groundfish rebuilding and on the economic viability (Section 7.3.5) of fishing for monkfish.

The percent species composition in the landings (Table 89) appears in the weightout data for trips where monkfish account for 50 percent or more of total revenue. On similar trips, the following species listed in Table 120 were observed in the catch by sea samplers during 1993.

Table 119. Percent of total landings for bycatch on trips when monkfish accounted for more than 50 percent of total revenue, 1991-1994. Source: NMFS weighout data.

Species	*Otter trawl*		*Sink gillnet*		*Sea scallop dredge*	
	Northern	Southern	Northern	Southern	Northern	Southern
Number of trips	1727	1088	2133	881	213	204
Monkfish	76.8	83.2	76.4	71.8	80.4	72.5
Butterfish	0.1	0.1	<0.1	<0.1	0.0	0.0
Cod	2.0	0.3	2.6	1.1	<0.1	0.1
Cusk	0.1	<0.1	0.3	0.0	<0.1	<0.1
Winter flounder	2.0	0.6	0.8	0.3	0.8	0.3
Summer flounder	0.1	1.6	0.1	0.1	0.3	1.4
Witch flounder	2.5	3.4	1.0	<0.1	0.7	0.1
Yellowtail flounder	1.6	0.6	0.3	0.1	0.6	0.8
American Plaice	6.8	0.2	0.7	0.0	0.7	0.3
Windowpane flounder	0.3	0.1	<0.1	0.0	0.1	0.1
Other flounders	4.7	0.4	0.8	<0.1	0.4	0.1
Haddock	0.1	<0.1	<0.1	<0.1	<0.1	0.0
Red hake	0.2	0.3	<0.1	<0.1	0.0	0.0
White hake	1.2	1.4	0.2	<0.1	<0.1	<0.1
Herring	<0.1	0.0	<0.1	<0.1	0.0	0.0
Mackerel	<0.1	0.1	0.1	0.4	0.0	0.0
Menhaden	0.0	0.0	0.0	0.1	0.0	0.0
Ocean Pout	0.1	<0.1	0.0	0.0	0.0	0.0
Pollock	0.3	<0.1	0.6	<0.1	<0.1	<0.1
Redfish	0.1	0.1	<0.1	0.0	0.0	0.0
Scup	<0.1	0.3	<0.1	<0.1	0.0	<0.1
Black sea bass	<0.1	0.1	0.0	<0.1	0.0	<0.1
Dogfish	0.5	0.2	7.0	3.1	0.0	0.0
Skates	4.1	1.2	2.3	11.4	0.0	0.5
Tautog	<0.1	<0.1	0.0	0.5	0.0	0.0
Silver hake	0.8	2.6	0.1	<0.1	<0.1	<0.1
Wolffish	0.3	0.1	0.6	0.0	0.4	<0.1
Tilefish	<0.1	0.2	0.0	<0.1	0.0	0.0
Other finfish	2.9	0.6	14.0	11.5	0.4	0.1
Crabs	<0.1	0.1	0.0	<0.1	0.0	<0.1
Lobster	0.2	0.6	<0.1	<0.1	<0.1	<0.1
Shrimp	<0.1	0.0	0.0	0.0	<0.1	0.0
Sea scallop	<0.1	<0.1	0.0	0.0	2.0	2.7
Long-finned squid	0.4	0.7	0.0	<0.1	0.0	0.1
Short-finned squid	<0.1	<0.1	0.0	0.0	0.0	0.0
Other shellfish	<0.1	<0.1	0.1	0.5	0.0	0.0

Table 120. Occurrence of species observed on sea sampled trips when monkfish accounted for more than 50 percent of total revenue, 1993. K = Kept, D = Discarded. Source: 1993 Sea Sampling Observer Program data.

Species	*Otter trawl*		*Sink gillnet*		*Sea scallop dredge*	
	Northern	Southern	Northern	Southern	Northern	Southern
Number of trips	1727	1088	2133	881	213	204
Monkfish	76.8	83.2	76.4	71.8	80.4	72.5
Butterfish	0.1	0.1	<0.1	<0.1	0.0	0.0
Cod	2.0	0.3	2.6	1.1	<0.1	0.1
Cusk	0.1	<0.1	0.3	0.0	<0.1	<0.1
Winter flounder	2.0	0.6	0.8	0.3	0.8	0.3
Summer flounder	0.1	1.6	0.1	0.1	0.3	1.4
Witch flounder	2.5	3.4	1.0	<0.1	0.7	0.1
Yellowtail flounder	1.6	0.6	0.3	0.1	0.6	0.8
American Plaice	6.8	0.2	0.7	0.0	0.7	0.3
Windowpane flounder	0.3	0.1	<0.1	0.0	0.1	0.1
Other flounders	4.7	0.4	0.8	<0.1	0.4	0.1
Haddock	0.1	<0.1	<0.1	<0.1	<0.1	0.0
Red hake	0.2	0.3	<0.1	<0.1	0.0	0.0
White hake	1.2	1.4	0.2	<0.1	<0.1	<0.1
Herring	<0.1	0.0	<0.1	<0.1	0.0	0.0
Mackerel	<0.1	0.1	0.1	0.4	0.0	0.0
Menhaden	0.0	0.0	0.0	0.1	0.0	0.0
Ocean Pout	0.1	<0.1	0.0	0.0	0.0	0.0
Pollock	0.3	<0.1	0.6	<0.1	<0.1	<0.1
Redfish	0.1	0.1	<0.1	0.0	0.0	0.0
Scup	<0.1	0.3	<0.1	<0.1	0.0	<0.1
Black sea bass	<0.1	0.1	0.0	<0.1	0.0	<0.1
Dogfish	0.5	0.2	7.0	3.1	0.0	0.0
Skates	4.1	1.2	2.3	11.4	0.0	0.5
Tautog	<0.1	<0.1	0.0	0.5	0.0	0.0
Silver hake	0.8	2.6	0.1	<0.1	<0.1	<0.1
Wolffish	0.3	0.1	0.6	0.0	0.4	<0.1
Tilefish	<0.1	0.2	0.0	<0.1	0.0	0.0
Other finfish	2.9	0.6	14.0	11.5	0.4	0.1
Crabs	<0.1	0.1	0.0	<0.1	0.0	<0.1
Lobster	0.2	0.6	<0.1	<0.1	<0.1	<0.1
Shrimp	<0.1	0.0	0.0	0.0	<0.1	0.0
Sea scallop	<0.1	<0.1	0.0	0.0	2.0	2.7
Long-finned squid	0.4	0.7	0.0	<0.1	0.0	0.1
Short-finned squid	<0.1	<0.1	0.0	0.0	0.0	0.0
Other shellfish	<0.1	<0.1	0.1	0.5	0.0	0.0

7.1.6 Economic Impact Analysis

Economic assessment requires consideration of the benefits and costs of the proposed action. In the discussion that follows a quantitative assessment of gross benefits is presented. Due to the absence of an analytical assessment model for monkfish, no clear link between fishing effort, expected landings and fishing costs was possible. For this reason a quantitative assessment of expected costs could not be developed. A qualitative assessment of expected costs is, however, provided.

Although there is considerable uncertainty in the results, the preferred alternative appears to increase net benefits by $20 million over 20 years, compared to the No Action alternative. There is a 52 percent chance that the gross revenues from the preferred alternative will exceed those from taking No Action. The gains in gross revenue are however underestimated for the preferred alternative, because the effect of the size limit and the rebuilt age structure will increase the proportion of larger, more valuable monkfish. The preferred alternative does not account for the gains in yield-per-recruit that are expected. In addition to the gains in gross revenue, there will create cost-savings of at least $18 million compared to the No Action alternative. Higher cost-savings are possible, depending on the allocations of days-at-sea in years four through ten. The net changes in gross revenues and costs exceed the expected administrative costs by a wide margin.

Longer mortality reduction schedules were rejected by the Councils because of the higher uncertainty in achieving OY in year 10. Although there appears to be a considerable gain that could be realized (provided that the population biomass rebuilds according to the assumptions made here), the Councils rejected a quicker schedule due to the impacts on the fishery, the higher transitional costs, and the uncertainty in the targets that could require the elimination of the directed fishery. The three-year period until overfishing is stopped is necessary to collect better data and more accurately estimate the biological targets.

7.1.6.1.1 Limited entry qualification criteria

Vessels that will qualify for monkfish limited access tend to rely more heavily on the landings of monkfish for their annual revenue during the four-year qualification period (Table 121). Monkfish revenue contributes 16-25 percent of the annual revenues for multispecies vessels that qualify for monkfish limited access vs. 7 percent for those that will not qualify. Similarly, scallop vessels that will qualify for monkfish limited access derive 9-15 percent of their annual revenue from monkfish landings, versus only 5 percent for non-qualifying scallop vessels. For vessels that do not have a multispecies day-at-sea permit, a scallop day-at-sea permit, or a summer flounder permit, the vessel that qualify for monkfish limited access derive 37-68 percent of their annual income from monkfish landings. Non-qualifying vessels derive only 22 percent of their annual income from monkfish landings. Vessels that do not have a Northeast Regional Office permit are likely to have underreported their monkfish landings in the voluntary weighout system. Revenue figures for these vessels are probably biased low.

Table 121. Preferred alternative qualification criteria. Percent of revenue derived from monkfish landings during the four-year qualification period. Data are from 1,815 vessels that landed at least one pound of monkfish during the qualification period and have not been removed from the fleet by the multispecies buyout program.

Permits currently held by vessel	Will not automatically qualify	Qualifies for low trip limit	Qualifies for high trip limit	Total vessels permitted in 1997
Multispecies DAS	7%	16%	25%	12%
Scallop DAS	5%	15%	9%	7%
Combination	4%	10%	13%	10%
Summer Flounder	8%	31%	16%	9%
Other	22%	37%	68%	24%
No NERO permit	10%	27%	18%	11%
All vessels	10%	17%	18%	12%

7.1.6.1.2 Gross Benefits

Gross benefits consist of the sum of gross revenues from the sale of monkfish products and consumer surplus. For some of the reasons described below, no reliable relationship between domestic supplies and ex-vessel prices could be established and consequently consumer benefits could not be estimated. However, given the fact that most monkfish are not consumed in the U.S., gross revenues alone would comprise the majority of National benefits from the monkfish resource.

Estimates of monkfish revenues were obtained within the same stochastic simulation framework described in Section 7.1.5.2.5.1. This procedure reflects uncertainty in both the biological response to management and the economic conditions that might prevail. Given these uncertainties the economic results will be reported primarily in probabilistic terms. The following sections describe the procedures used to estimate gross revenues under the status quo and the preferred alternative.

Expected Prices

It is desirable to develop a statistical model of ex-vessel prices to forecast changes in price as anticipated landings change. Such models are only possible, however, where consistent relationships between quantities supplied and prices received can be estimated. Previous analysis of monkfish prices found no such consistent relationship between dockside prices and quantities supplied (Section **5.4.5.2.2**). Correlations between prices and supplies were either statistically insignificant or the relationship was counter-intuitive. Consistent with economic theory, some correlation coefficients were negative, implying prices go down as quantities increase. In other cases, the relationships were positive implying that prices increase with increased supplies, disagreeing with standard economic theory.

The inability to estimate a reliable model of price behavior is probably due to the fact that international markets determine US domestic monkfish prices. Dominant factors such as economic conditions in exporting countries and global supplies of monkfish cause domestic prices to be insensitive to local supply.

In lieu of a predictive relationship between domestic supplies and domestic prices, monkfish prices were assumed to vary about a constant mean that was independent of domestic supply. Future prices were determined to be stochastic with a normal distribution having a mean and standard deviation equal to that from 1995-97 monthly price data by market category. This distribution of expected prices was truncated at the minimum and maximum observed values. Prices used to forecast future benefits were restricted so that they would not occur outside the range observed data. These parameters that were used to predict price are given in Table 122.

Table 122. Monthly weighted average prices by market category ($/pound 1995-1997).

Mean	Tails				Other product forms				
	Uncl.	Large	Small	Peewee	Livers	Round	Cheeks	Bellys	Whole
January	1.33	1.73	1.05	0.44	4.45	1.11	0.80		1.05
February	1.27	1.72	1.05	0.57	2.58	0.87	1.51	1.10	0.88
March	1.30	1.76	1.09	0.61	1.64	0.90	0.76		0.95
April	1.32	1.76	1.10	0.66	0.96	0.89	1.05	2.00	0.88
May	1.27	1.72	1.08	0.65	0.84	0.76	1.10		0.73
June	1.25	1.65	1.06	0.59	0.87	0.71	0.75	1.30	0.75
July	1.25	1.66	1.03	0.50	0.87	0.87	1.05		0.99
August	1.29	1.72	1.08	0.59	1.31	1.02	0.37		1.13
September	1.25	1.78	1.11	0.80	3.16	0.98	0.95		1.06
October	1.26	1.76	1.16	0.71	4.93	0.86	1.02		0.91
November	1.35	1.79	1.16	0.66	5.83	0.83			0.86
December	1.43	1.77	1.11	0.63	6.55	0.86	0.78		0.82
Standard deviation									
January	0.38	0.32	0.28	0.24	2.12	0.42	0.61		0.34
February	0.36	0.32	0.25	0.30	1.11	0.23		0.25	0.38
March	0.37	0.31	0.25	0.28	1.02	0.18	0.19		0.2
April	0.39	0.33	0.27	0.31	0.58	0.21	0.33		0.16
May	0.40	0.29	0.25	0.26	0.46	0.24	0.70		0.18
June	0.36	0.27	0.23	0.22	0.51	0.19	0.57	0.99	0.21
July	0.35	0.25	0.23	0.21	0.46	0.19	0.58		0.27
August	0.33	0.28	0.22	0.24	0.71	0.25	0.16		0.28
September	0.36	0.29	0.24	0.30	1.13	0.20	0.09		0.28
October	0.39	0.24	0.26	0.23	1.11	0.14	0.26		0.16
November	0.46	0.26	0.25	0.27	1.75	0.16			0.19
December	0.42	0.26	0.23	0.29	2.31	0.31	0.14		0.19
Minimum									
January	0.10	0.25	0.09	0.07	0.33	0.09	0.60		0.20
February	0.24	0.16	0.20	0.09	0.25	0.18		0.75	0.25
March	0.25	0.25	0.25	0.14	0.05	0.03	0.63		0.20
April	0.20	0.40	0.20	0.13	0.10	0.05	0.75		0.47
May	0.10	0.24	0.16	0.11	0.04	0.14	0.60		0.21
June	0.10	0.20	0.13	0.10	0.10	0.06	0.42	0.60	0.20
July	0.02	0.30	0.17	0.07	0.07	0.10	0.41		0.12
August	0.24	0.09	0.20	0.08	0.20	0.33	0.25		0.23
September	0.25	0.20	0.18	0.09	0.08	0.44	0.89		0.29
October	0.05	0.16	0.10	0.10	0.29	0.40	0.83		0.27
November	0.02	0.07	0.05	0.15	0.25	0.03			0.30
December	0.01	0.23	0.03	0.09	0.03	0.20	0.62		0.20
Maximum									
January	3.00	3.00	7.76	1.63	11.00	2.70	1.00		3.00

February	3.25	4.20	2.35	1.75	7.95	2.00		1.51	9.19
March	3.00	3.92	3.25	1.40	7.00	2.00	0.90		2.27
April	3.33	3.60	2.30	1.50	4.50	2.00	1.40		1.81
May	2.53	3.50	3.02	2.00	4.50	3.00	1.60		2.00
June	2.50	3.00	3.00	1.50	1.40	1.80	1.76	2.00	2.03
July	2.67	4.35	9.00	1.21	6.51	1.79	1.50		6.25
August	3.00	4.00	2.59	1.96	13.50	2.00	0.48		9.22
September	3.00	4.67	2.00	3.74	7.12	1.79	1.02		2.07
October	5.50	3.09	10.00	1.40	10.29	1.80	1.20		2.10
November	7.24	4.00	7.53	1.45	16.35	1.76			2.59
December	2.51	4.11	8.00	1.75	14.00	2.60	0.90		2.10

Expected Landings

The procedures used to estimate future yield are described in Section 7.1.5.2.5.1. The median estimated yield values for the preferred and No Action alternatives are given in Table 117. The inability to predict future landings at age or size prevented estimation of improved economic benefits due to growth and delayed harvesting. Instead, the monthly average proportion of landings by market category were assumed to be unaffected by the management measures. Although the management measures would prohibit possession of monkfish in the pewee tail market category, it was not possible to project the improved yield that would result from harvesting these fish at a larger, more valuable size. It was also not possible to predict the future changes in market composition from an expanded age-structure that would result from reduced fishing mortality. Seasonality also affects the landings of monkfish by market category and it could not be assumed that an expanded age-structure would be applicable to all months or areas fished. As a substitute for a model that would predict future landings by size, the Councils assumed that landings by market category would occur in the same proportions as were observed during 1995-1997 (Table 123). The results given below, therefore underestimate the potential value of the preferred alternative relative to No Action.

Table 123. Weighted Average Monthly Proportion of Monk Landings by Market Category (1995-1997).

	Tails				Other product forms				
	Tail Only	Large	Small	Peewee	Livers	Round	Cheeks	Bellys	Whole
January	0.7512%	1.4041%	1.5585%	0.2106%	0.5707%	0.8914%	0.0001%		2.3415%
February	0.5433%	1.5040%	1.7229%	0.1507%	0.5785%	0.9133%	0.0001%	0.0067%	1.8171%
March	0.5404%	1.5938%	1.6247%	0.2083%	0.3514%	1.5021%	0.0001%		1.5194%
April	0.4432%	1.4712%	1.4344%	0.1822%	0.1876%	1.2534%	0.0005%	0.0000%	1.4197%
May	0.9076%	2.1617%	1.9718%	0.2295%	0.2078%	2.3987%	0.0006%		4.2342%
June	0.8791%	2.5610%	2.4235%	0.2542%	0.0544%	1.2293%	0.0014%	0.0010%	3.2492%
July	0.4429%	1.7595%	2.0144%	0.1860%	0.0342%	1.1707%	0.0006%		1.1669%
August	0.2843%	1.3564%	1.8643%	0.1414%	0.1107%	0.8312%	0.0002%		1.1210%
September	0.2836%	1.4131%	1.9435%	0.1549%	0.3520%	0.5411%	0.0001%		1.5974%
October	0.4196%	2.1339%	2.9661%	0.1698%	0.6950%	0.8285%	0.0001%		2.2303%
November	1.0731%	2.1064%	2.7057%	0.1730%	0.8512%	0.6619%			3.3193%
December	0.8268%	2.1543%	2.3707%	0.1440%	0.8070%	0.5017%	0.0009%		2.6282%

Gross Revenues

Gross revenues were estimated for the preferred and No Action alternatives by applying the prices described above to the yield estimates in Section 7.1.5.2.5.1. These revenue streams were discounted at a 7.0% annual rate. Applying this discount rate to the difference between revenues for the No Action and preferred alternatives estimates the net present value of gross benefits to be gained by the preferred alternative relative to No Action. Figure 46 shows the median and the 80 percent confidence interval for the net present value of the difference in gross revenues for each year of the 20-year projection period.

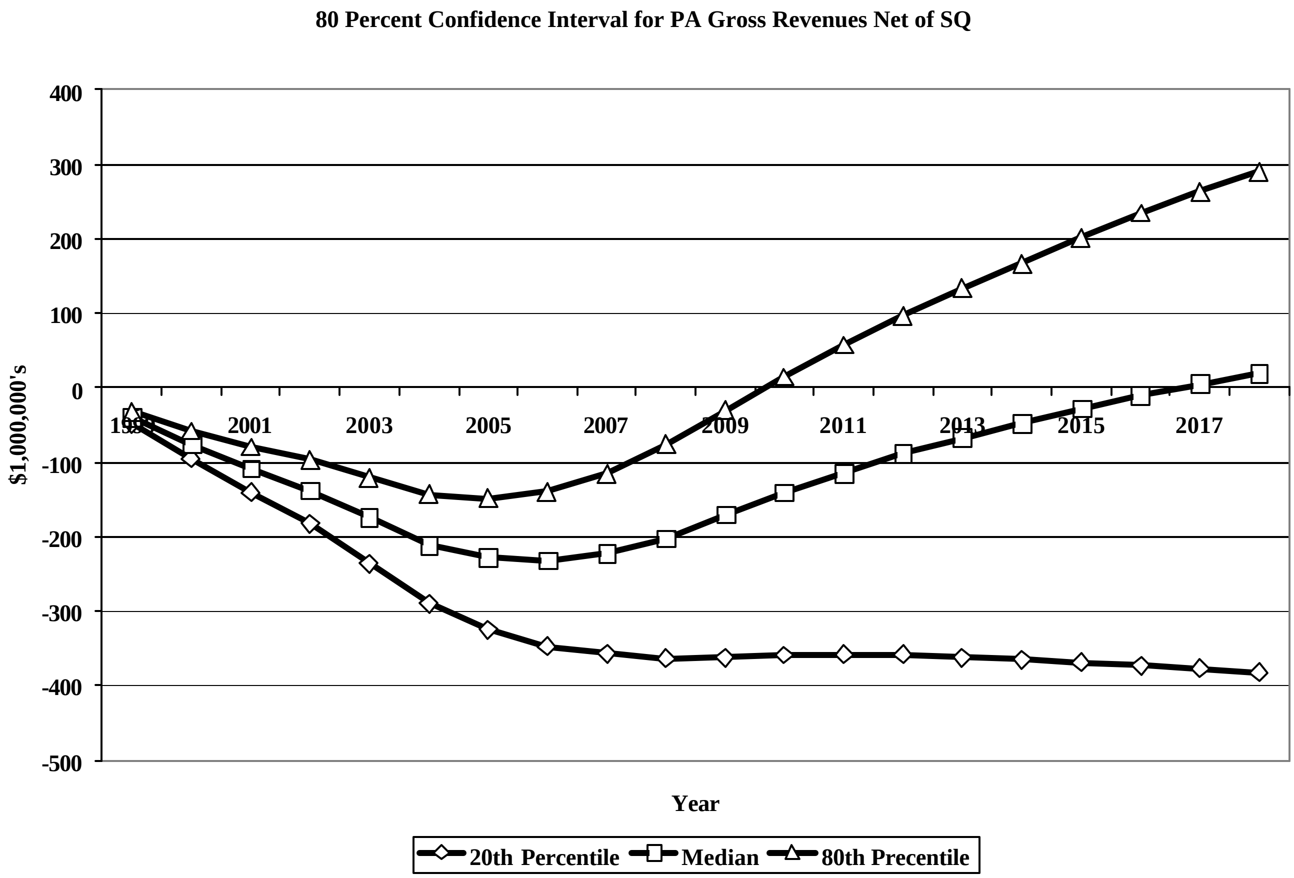

Figure 46. Cumulative change in net present value of gross revenues for the preferred alternative versus the No Action alternative.

The values reported in Figure 46 are therefore cumulative differences of the discounted stream of gross revenues, illustrating the present value of benefits from taking the preferred alternative for any given time horizon from 1 to 20 years. For example, the median net present value of the change in gross revenue is -$174 million after year 5, -$202 million after year 10, -$68 million after year 15 and $20 million after year 20. These results indicate that at median values, the present value of the preferred alternative does not exceed the No Action alternative until the year 2017. If these projections underestimate the future yield and pricing, the present value of the preferred alternative (at the 80th percentile) would exceed the No Action alternative by the year 2010 (two years after the projected 10 year rebuilding program). By contrast, if conditions turn out to be worse than anticipated, the present value of the preferred alternative (net of the No Action alternative) would be negative throughout the rebuilding period and beyond.

The probability that the present value of the preferred alternative gross revenues net of the No Action alternative would be positive after 10 and 20 years is illustrated in Figure 47 and Figure 48, respectively. In each case, the cumulative probability distribution of the net present value of the gain in gross revenues for the preferred alternative compared to the No Action alternative. For example, in year 10 there is a 50% chance that the present value of preferred alternative gross revenues net of the No Action alternative will be -$200 million or less (Figure

47). Similarly, in year 10 there is a 94% chance that the present value of the preferred alternative gross revenues net of the No Action alternative will be less than or equal to zero. There is an 80 percent probability that the net benefits from gross revenues for the preferred alternative will be between $80 and $340 million less than the No Action alternative through year 10. The negative cumulative gross revenue results from the short run reductions in landings that would be required to rebuild the monkfish resource and that rebuilding does not result in increased yield compared to the No Action alternative until nine years into the rebuilding schedule.

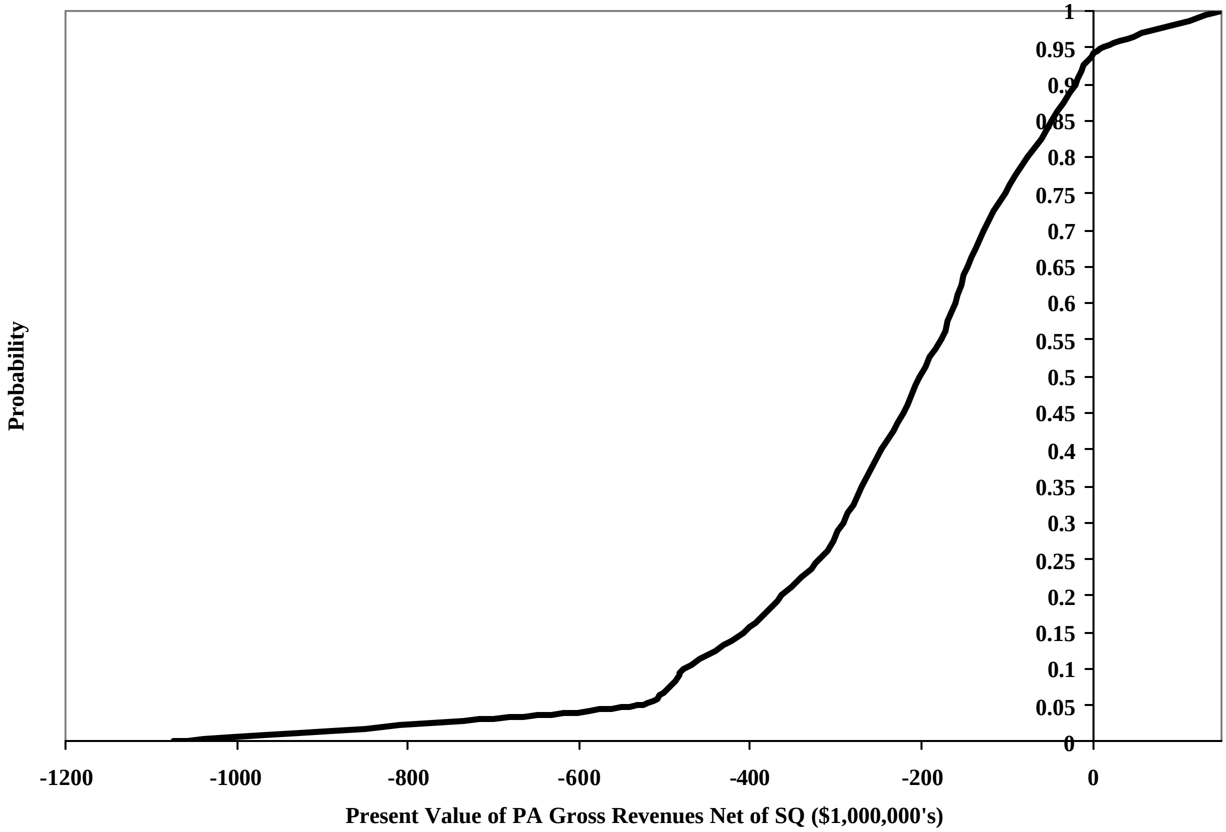

Figure 47. Cumulative distribution of the difference between the preferred and No Action alternatives for net present value of gross revenues through ten years (2009). The distribution implies that there is a 94% probability that the net present value of gross revenues for the preferred alternative will be negative, compared to the No Action alternative.

Over a longer time period, however, the probability that the present value of preferred alternative gross revenues net of the No Action alternative will be positive increases to 55% (Figure 48) for the realizations of the present value of preferred alternative gross revenues net of the status quo in twenty years. There is an 80 percent probability that the net benefits from gross revenues for the preferred alternative will be between a net loss of $380 million and a net gain of $290 million less compared to the No Action alternative through year twenty. This increased likelihood of the benefits of the preferred alternative exceeding the No Action alternative is due to the large differences between the potential yield under rebuilt resource conditions as compared to allowing current exploitation rates to continue. The optimum yield, predicted to result beyond year 10 for the two management areas, is highly uncertain, reflected in the wide differences between the upper and lower 80th percent confidence intervals.

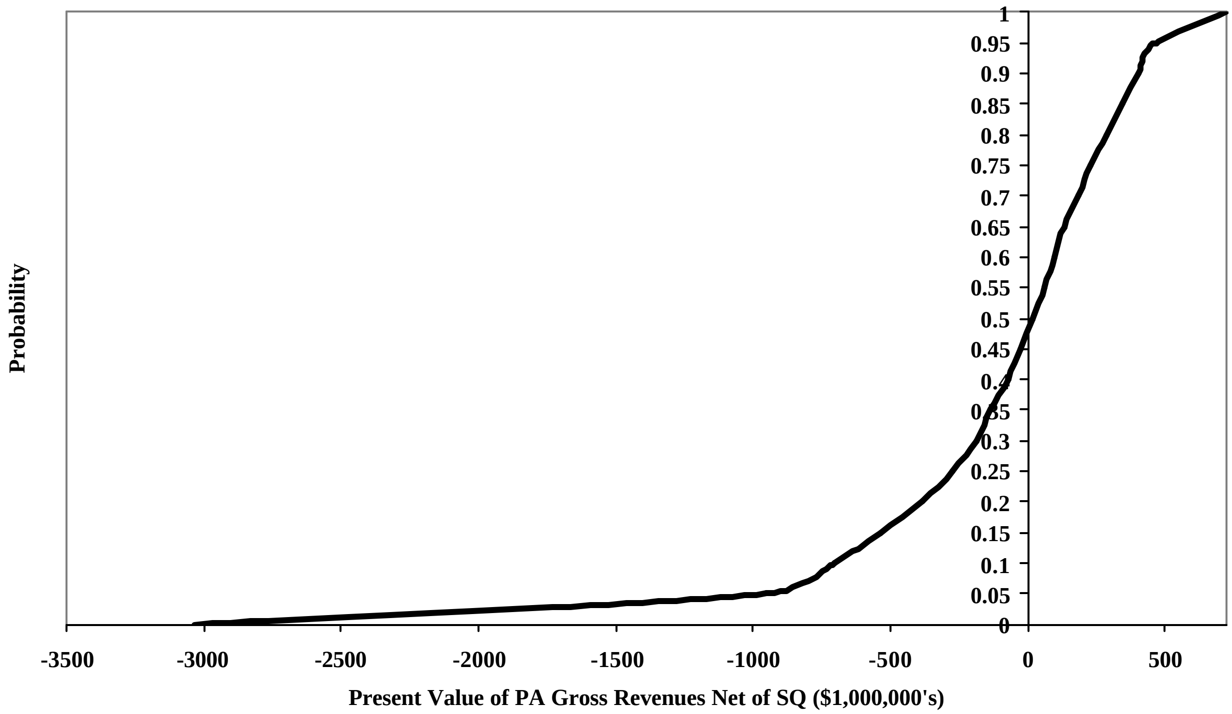

Figure 48. Cumulative distribution of the difference between the preferred and No Action alternatives for net present value of gross revenues through twenty years (2018). The distribution implies that there is a 47% probability that the net present value of gross revenues for the preferred alternative will be negative, compared to the No Action alternative.

7.1.6.1.3 Fishing Costs

If implemented, the default measures for the preferred alternative would prohibit directed fishing for monkfish. The preferred alternative would allow the allocation of days-at-sea for limited access monkfish vessels only if there is sufficient TAC that exceeds the expected monkfish catch in other fisheries. The number of days-at-sea that would be allocated would depend on the harvesting capacity of the fleet and the target TAC net of the expected bycatch. It is not possible to predict the relative mix or timing of these measures at this time, however. In the short term, it is expected that the preferred alternative will require no allocation of days-at-sea until rebuilding occurs.

The economic analysis conducted for Amendment 7 to the Multispecies FMP used expected days-at-sea allocations to forecast fishing costs. In the present case the approach is not possible, because there is no way to predict whether the default measures will be required, how many years they may remain in place, and at what rate fishing effort will be permitted to increase. Given the current default measures there could be little expectation that the forecasted fishery yields could be produced without some allocation of days-at-sea to target monkfish. For these reasons no quantitative costs estimates could reasonably be predicted for any year after year 3 (calendar year 2001) and no net benefit (i.e. revenues net of fishing costs) estimates are provided.

In cases of mixed species fisheries, harvesting costs can be difficult to allocate to a specific species. For any given trip, a species may be the target, component catch, or simply an unexpected, yet marketable, bycatch. For purposes of analysis, fishing costs were assigned to monkfish if monkfish comprised 30% or more of total trip revenue. Since the preferred alternative will reduce the number of vessels as well as limit the number of days at sea for limited access vessels, the number of occasions where total monkfish revenues would exceed 30% of trip revenues is expected to decline. Some cost savings related to monkfish targeting would be expected to accrue for three or more years after plan implementation. While it is not possible to project management strategies and their attendant costs beyond year 3, the combination of limited access and days-at-sea limits will reduce costs beyond year 3 since qualified vessels will likely be more productive than if the current open access fishery were allowed to continue.

Fishing costs for the No Action alternative and years 1-3 for the preferred alternative were estimated in the following manner. A combination of vessel logbook and dealer data were used to estimate the total number of trips taken during calendar year 1997 where monkfish revenue comprised 30% or more of aggregate trip revenues. These data were then sorted by major gear categories (scallop dredge, bottom trawl, staked gillnet, and all other gears). The management measures including day-at-sea allocations and trip limits were applied as prescribed in the preferred alternative and the number of trips that exceeded monkfish revenues of 30% was recalculated. Average fishing costs for bottom trawl gear and scallop dredge were determined from Capital Construction Fund data. These average costs were $1,082 and $1,124 per day-absent for trawl and dredge vessels, respectively. An average cost per day absent for gillnet vessels ($275) was based on the estimates for the multispecies fishery (see break-even analysis in the Amendment 7 FSEIS for the Multispecies FMP [Table E.7.2.8a]). A median value of $500 per day absent was assigned to all other trips where gears other than trawl, dredge or gillnet were used. The resulting estimates of fishing costs are reported in Table 124. Note that there were only minor difference between year 1 and year 2 and 3 estimates of fishing costs (fishing costs in years 2 and 3 were slightly lower), so only year one fishing costs are reported.

Table 124. Estimated fishing costs.

	Status quo			Preferred alternative	
	Trips	Total Cost ($)	Cost per Day ($)	Trips	Total Cost ($)
Other Gear	958	479,000	500	281	140,500
Trawl	6,990	7,563,180	1,082	3,452	3,735,064
Gillnet	5,329	1,465,475	275	1,339	368,225
Scallop	736	827,264	1,124	50	56,200
Totals	14,013	10,334,919		5,122	4,299,989

The total number of trips where monkfish revenues would exceed 30% of trip revenue was projected to decrease by nearly 66% and fishing costs were projected to be reduced from $10.3 million to $4.3 million; a savings of $6.0 million. These savings would be expected to continue to accrue for three or more years for the preferred alternative, a savings of at least $18.0 million.

7.1.6.1.4 Other Costs

Costs to processors, enforcement costs, and administrative costs are identified in the PRA analysis, Section 7.7. Other non-tangible costs to processors and enforcement costs are described below.

Costs to Processors

There are few, if any, product substitutes for monkfish and there are no known alternative domestic sources for monkfish. For these reasons, processors whose business depends upon monkfish supplies will be forced to substantially reduce their business activity or will be forced to diversify into other product lines. Public hearing testimony offered by Dr. Dan Georgianna on behalf of the port of New Bedford, indicate that the processor value of monkfish products could exceed $14.5 million in that port (Appendix . At median values, year 1 landings are projected to decrease by 62% relative to the No Action alternative. This would represent a proportional reduction in revenues to all processors. The impacts on New Bedford processors could be proportional to the total or could be proportionally greater or less than the total depending upon the relative share New Bedford processors have of the total monkfish processing market. In the longer run, processor revenues would be expected to increase substantially under the preferred alternative as compared to the No Action alternative.

Enforcement Costs

The additional measures for monkfish including different size restrictions by area and adding new vessels to the day-at-sea program will impose an added enforcement burden. The economic costs of these new enforcement requirements depend upon whether or not new revenues must be raised from taxpayers to pay for the added enforcement burden and/or the opportunity cost of the value of enforcement services that must be diverted from other activities to enforce the monkfish regulations.

In the event that no new revenues are raised from the public to pay for monkfish enforcement then, from a budgetary perspective, monkfish enforcement costs are merely a transfer payment from one enforcement activity to another. However, enforcement services have value and adding new enforcement responsibilities necessarily takes away from enforcement services that are devoted to other fisheries. Thus, the cost of adding monkfish is measured by the opportunity cost (i.e. forgone benefits) of reducing the enforcement services devoted to other activities to monkfish. Unfortunately, no empirical studies have been conducted to measure the value of enforcement services provided in Northeast region fisheries, making estimation of enforcement costs impossible.

7.1.6.1.5 Economic Impacts of Non-Selected Alternatives

The Councils rejected rebuilding periods longer than the preferred alternative, because they would not have met the Magnuson-Stevens Act stock rebuilding requirements. A four-year phase-in for mortality reduction was selected to minimize the transitional costs associated with a large mortality reduction and to gather better information before imposing management restrictions that would eliminate the directed fishery. This phase-in would reduce the economic dislocations that might be expected under a more rigorous effort reduction schedule.

Estimates of gross revenues for quicker effort reductions indicate that a shorter period could produce considerable economic gains. To provide some indication of the potential economic value of a quicker mortality reduction schedule, it was assumed that the targets would be met one year sooner as compared than the preferred alternative (i.e. mortality would decline below the overfishing thresholds in three years rather than four). Gross revenues for this non-preferred alternative in Section 7.1.6.1.2 were estimated using the same stochastic framework and assumptions described above.

Table 125. Comparison of the net present value of gross revenues (million dollars) for a four year mortality reduction schedule (preferred alternative) versus a three years (non-preferred alternative).

	10 Years			***20 Years***		
Percentile	Preferred alternative	Non-preferred alternative	Difference	Preferred alternative	Non-preferred alternative	Difference
20th	-364	-297	67	-382	-301	81
50th	-202	-146	56	19.6	77.9	58
80th	-75.7	-20.9	55	290	346	56

The median value of net present value of gross revenue for non-preferred alternative versus the No Action alternative is estimated to be -$146 million after 10 years and $77.9 million after 20 years. These values exceed that of the preferred alternative by $56 and $58 million, respectively. The minor difference between the year 10 and year 20 present values is due to the fact that the preferred alternative and non-preferred alternative expected landings are identical in years 11 through 20. Thus, nearly all of the improved economic benefits of achieving the biological targets one year sooner accrue during the first 10 years of the management program. About 1/3rd of that increase occurs in year 10 of the comparison due to the harvest of OY in year 10 for the non-preferred alternative. Specifically, the discounted expected value of gross revenues net of the No Action alternative was projected less for the non-preferred alternative compared to the preferred alternative, because mortality reduction and lower landings would be advanced by one year. During year 3 the discounted expected value of non-preferred alternative revenues was estimated to be lower then the preferred alternative by approximately $10 million and was projected to be lower by $2 million in year 5. For the next five years, however, the discounted expected value of non-preferred alternative revenues exceeded that of the preferred alternative by an annual average of $13 million, due to the assumed rebuilding that would occur in nine years, rather than ten.

Compared to the median, the results indicate that the difference between the preferred alternative and the non-preferred alternative is approximately the same at the 80th percentile of the gross revenue realizations. By contrast, the results at the 20th percentile indicate that reaching the rebuilding targets earlier reduces the magnitude of the lower values of the gross revenue distribution proportionally more than at the median and 80th percentiles. Thus, there is a higher probability that the economic value of the non-preferred alternative would exceed the No Action alternative after 10 years (10%) and after 20 years (65%), compared to the preferred alternative (5% and 55% respectively).

7.1.7 Social Impact Assessment

This section examines the social impacts of the proposed regulations, both in terms of the distribution of the economic impacts and in terms of likely resultant social and cultural impacts

7.1.7.1 Introduction

Dyer and Griffith (1996, Chapter 2) note in their study of groundfish fishing communities that ? fishers tend to agree that the government is overregulating some species (e.g., haddock) while underregulating others (e.g., monkfish and dogfish).? This is supported by numerous public comments received during public hearings for this Amendment. Thus there is a consensus that monkfish management is needed. However, monkfish has also become an important target and by catch fishery for some of the Region? s fishermen, partly in response to increased prices but also as an alternative to increasingly restrictive regulations in traditional groundfish and scallops in recent years.

Dyer and Griffith further note, for example (ibid., chapter 3, part B), that ? attempts have been made in Gloucester to innovate and change in response to Amendment # 7 by shifting effort away from groundfish towards other underutilized midwater and bottom species? ? including monkfish with their high value livers. Georgianna and Cass (1997, p.2) describe the same process in New Bedford, indicating that the bycatch fishery for scallopers has been a longstanding component of that fishery, but increased targeting by s callopers and others has resulted from Amendments 5 and 7 of the Northeast Multispecies FMP ? implemented in 1994 and 1996, respectively. McCay et al. (1993) described similar findings. Dyer and Griffith (Chapter 3) also comment on monkfishing in Chatham, describing the relatively harmonious relationship in Chatham between monkfisher gillnetters and lobstermen. Thus monkfishing is increasing common throughout New England.

Turning to the southern range -- Hampton Roads/Newport News, VA, and Wanchese, NC, Dyer and Griffith state (Chapter 4): ? At this, the southern range of the ground fishing fleet, fishers who are native to the area have developed a multi-species, multi-gear, highly flexible fishing strategy that relies on state and federal waters and includes the commercial exploitation of several species. Unlike the fleet based in the Gulf of Maine, the winter season along North Carolina's Outer Banks and the mouth of the Chesapeake is a heavy sink net fishing season, when commercial fishers target weakfish, various basses, flounder, monkfish bycatch, and dogfish. During this season, as well, fishers from several ports in the northeast also land fish at the fish houses of Wanchese, North Carolina and the two Virginia ports of Hampton Roads and Newport News. During a visit in March 1996, we encountered three New Bedford-based fishers off-loading monkfish and monkfish livers from a 40' craft at one of the principal seafood dealers in Wanchese, and in Portland we listened while fishers related stories of wintering off North Carolina's coast, as much to escape the chilling Gulf of Maine winter as to catch and land fish.? In addition: ? Based on visits to the area and interviews primarily with seafood dealers, there are around 80 to 100 trawlers in the 60' to 100' range that land fish in the Hampton/Newport News area, although not all of these are local vessels. These fish for flounder--known throughout the Northeast as "fluke"--in the winter time and scallop in the summer. An important bycatch of the scallop fishery in this region are monkfish.?

Although this impact assessment can only address impacts of this FMP, social impacts will continue to affect ports due to cutbacks days-at-sea allocations in the groundfish and scallop fisheries, and the cumulative impact of these combined regulations.

7.1.7.2 Overarching Issues

There are several broad features of the proposed management measures which will affect all vessels ? limited entry and the use of days-at-sea for effort control. They will be discussed first. Then more specific measures affecting subsets of the monkfish fishery will be reviewed. Both limited entry and days-at-sea are already features of both the Multispecies and the Scallop FMP.

Given that a large number of the vessels in the monkfish fishery are involved in these two fisheries, using these features minimizes the complexity of the regulations for many fishermen. However, there are negative impacts for some vessels associated with each of these measures. Finally, the combination of measures will also have an effect. However, the exact nature of the combined effect cannot be predicted with any precision.

The subsections below describe: 1) those who began monkfishing after the control date, 2) those who fished within the qualifying period but had insufficient landings to qualify, and finally 3) the 1401 vessels identified in the RFA as economically impacted.

7.1.7.2.1 Limited Entry

While there has been some concern among Northeast fishermen about the impacts of limited entry (see discussions in the Multispecies Amendment 5 and 7 EISs and Scallop Amendment 4 EIS), it is now an established tool in the repertoire of Northeast fishery management. To the extent concerns remain they are centered on issues of generational access (assuring children an opportunity to fish) and the potential for limited access being a first step toward property rights.

Vessels that will be adversely affected by monkfish limited entry fall into two categories: 1) those who began targeting monkfish after February 27, 1995 (308 vessels) and 2) those who fished within the qualifying period, but did not land sufficient levels of monkfish to meet the qualifying criteria (1,216 vessels). Within this second category, the impacts will be greatest on the vessels that targeted monkfish on at least one trip. For the purposes of the Regulatory Flexibility Analysis, a trip targeting monkfish is defined as one where 30% or more of total revenue is from monkfish landings. Even for these vessels, however, their annual monkfish revenue may not constitute >30% of their total revenue for all species landed throughout the year. This latter definition of targeting is used here in this section.

7.1.7.2.1.1 Vessels that began targeting monkfish after the control date

The majority of these 308 vessels are under 45 ft and 50 GRT (Table 126 and Table 127). This is the size category that comprises the largest proportion of the overall Northeast fleet. Thus although small to mid-sized vessels will be most impacted among those who began targeting monkfish after the end of the qualifying period, this reflects the preponderance of that size category in the fleet rather than a disproportionate impact on one size category versus another.

Table 126. Vessels that targeted monkfish after the control date and do not qualify for monkfish limited access. Source: 1997 NER permit data.

Length category	Number of vessels	Percent
0-30 ft	45	14.6
31-45 ft	185	60.1
46-60 ft	31	10.1
61-100 ft	45	14.6
101+ ft	2	0.6
Total	308	100

Table 127. Vessels that targeted monkfish after the control date and do not qualify for monkfish limited access. Source: 1997 NER permit data.

Tonnage Category	Number of vessels	Percent
0-4 GRT	36	11.7
5-50 GRT	208	67.5
51-100 GRT	41	13.3
101-150 GRT	13	4.2
151+ GRT	10	3.2
Total	308	100

These vessels are concentrated in Massachusetts, followed by New York, Maine, New Jersey, Rhode Island, and New Hampshire (Table 128). The individual ports with the largest concentrations of these vessels (i.e., groups of 10 or more) are Boston, Gloucester, New York City and Montauk (Table 129). These are also ports with large numbers of permits overall, which can mitigate the impacts. The importance of groundfishing in Boston and Gloucester may make them more vulnerable to cumulative impacts of monkfish combined with groundfish restrictions.

Table 128. Distribution of vessels that targeted monkfish after the control date and do not qualify for monkfish limited access by state. Ports with less than three vessels are not shown. Source: 1997 NER permit data.

Home port state	Number of vessels	Primary port state	Number of vessels
MA	127	MA	118
ME	26	ME	34
NC	14	NC	20
NH	15	NH	20
NJ	21	NJ	32
NY	56	NY	50
PA	9	PA	
RI	16	RI	22
VA	7	VA	4
Other	17	Other	8

Table 129. Distribution of vessels that targeted monkfish after the control date and do not qualify for monkfish limited access by state. Ports with the majority of vessels are bold-faced and those with less than three vessels are not shown. Source: 1997 NER permit data.

State	Port	Number of vessels by home port	Number of vessels by primary port
MA	**Boston**	**47**	**6**
	Chatham	**10**	**15**
	Gloucester	**20**	**25**
	Green Harbor		4
	Harwich		3
	Harwichport		3
	Hingham		4
	Marblehead	6	5
	New Bedford/Fairhaven	**5**	**10**
	Rockport		4
	Scituate	6	6
ME	Kittery		4
NC	Beaufort-Morehead		4
	Vandemere	3	3
	Wanchese	4	6
NH	Hampton	3	3
	Portsmouth	4	7
	Rye		3
	Seabrook	3	4
NJ	Atlantic City		4
	Barnegat Light	3	9
	Cape May	3	6
	Point Pleasant	5	5
	Sea Isle City	3	3
NY	Greenport		5
	Hampton Bays	3	3
	Montauk	**11**	**16**
	New York	**31**	**4**
	Shinnecock		8
PA	Philadelphia	9	
RI	Narragansett		3
	Newport		3
	Point Judith	5	9
VA	Norfolk	7	
WV	Falling Waters	3	

Of the 308 vessels, 49 hold no 1997 Federal permits at all (16%). One-hundred eighty-five vessels (60%) hold a multispecies permit (Table 130), with 133 of those being limited access day-at-sea permits. One-hundred forty-three vessels (46%) hold a scallop permit, but only 9 are limited access day-at-sea. All but seven of the summer flounder, one of the lobster, and twelve of the squid-mackerel-butterfish permits shown below are commercial category permits. The lobster commercial permits, furthermore, are limited access. The large number of limited access multispecies permits and small number of scallop limited access permits in this group make it more vulnerable to cumulative impacts from changes in the groundfish FMP than the scallop FMP. Relatively few of these vessels possess multiple permits. Thus the strongest candidates for alternative fisheries are squid-mackerel-butterfish, tuna or species not yet under federal management. Longlines and ?Other? gear (Table 130) seem the most active in non-traditional species currently, followed by otter trawls and gillnets.

Table 130. Permits holding during 1997 by non-qualifying vessels that targeted monkfish during 1996-1997. Since some vessels hold more than one permit, total number of permits is higher than total number of vessels that are not expected to qualify for monkfish limited access.

Permit	Northeast Region Permit Status	Number of Vessels	Percentage of Vessels
By Individual FMP	Multispecies	185	60%
	Sea scallop	143	46%
	Summer flounder	59	19%
	Lobster	141	46%
	Squid/Mackerel/Butterfish	121	39%
	Scup	64	21%
	Black Sea Bass	54	18%
	Tuna	180	58%
	None	49	16%
By Common Combinations (10 vessels or more)	Tuna only	30	10%
	All 8 permits	12	4%
	Multispecies, Lobster, Scallop, Tuna	19	6%
	Multispecies, Scallop, Lobster, Squid/Mackerel/Butterfish, Tuna	16	5%
	Multispecies , Lobster, Tuna	11	4%

Of the 308 vessels, 30 targeted monkfish by an annual measure in 1997; 27 in 1996; and 12 in 1995 (Table 131). That annual measure is that monkfish revenue constituted over 30% of that vessel?s annual revenue. The majority of the 308 vessels that are not expected to qualify are dependent on monkfish for 10% or less of their annual income. The anticipated marginal impacts on annual revenue are estimated and described in Section 7.3.6.

Table 131. Annual monkfish revenue compared to total revenue for vessels that targeted monkfish during 1995-1997[38], but are not expected to qualify for monkfish limited access. Source: NMFS dealer data.

	Number of Vessels		
	1995	**1996**	**1997**
10%	100	117	134
20%	5	1	19
30%	0	6	8
40%	2	3	5
50%	0	4	4
60%	1	4	3
70%	3	4	3
80%	2	2	4
90%	1	3	5
100%	3	7	6
Total	117	151	191

Table 132 and Table 133 show that the gillnet and scallop dredge vessels have the largest per trip average revenues, and though scallop dredges take monkfish on many fewer trips per year than do gillnet vessels. Of the gillnetters, they are split between those with multispecies limited access permits and those without (Table 132). In all gears it is the 50-150 GRT fleet (the majority of Northeast vessels) that is hardest hit either because of a large number of trips or high average monkfish revenue per trip. The only exception to this size characterization is scallop dredge, where the highest revenues accrue to the largest vessels, those of 151 GRT or larger (Table 133).

[38] In any one year, not all vessels were fishing

Table 132. Annual monkfish revenue in 1997 by gear and limited access permit category for vessels that targeted monkfish, but are not expected to qualify for monkfish limited access.

Gear	Permit status	Monkfish revenue compared to total revenue	Average monkfish revenue per trip	Total DAS on monkfish trips
Fish Trawl	Multisp. DAS Only	8.77%	127	1581
	Scallop DAS Only	0.02%	35	14
	Multisp & Scallop DAS	0.00%	0	0
	Neither	0.95%	22	996
Gillnet	Multisp. DAS Only	33.49%	650	1178
	Scallop DAS Only	0.00%	0	0
	Multisp & Scallop DAS	0.00%	0	0
	Neither	26.00%	530	1121
Scallop Dredge	Multisp. DAS Only	0.12%	887	3
	Scallop DAS Only	2.36%	1319	41
	Multisp & Scallop DAS	0.00%	0	0
	Neither	2.68%	1912	32
Scallop Trawl	Multisp. DAS Only	0.00%	0	0
	Scallop DAS Only	0.01%	207	1
	Multisp & Scallop DAS	0.00%	0	0
	Neither	0.00%	0	0
Longline	Multisp. DAS Only	0.03%	<1	736
	Scallop DAS Only	0.00%	3	22
	Multisp & Scallop DAS	0.00%	0	0
	Neither	0.01%	<1	330
Other	Multisp. DAS Only	6.34%	93	1566
	Scallop DAS Only	0.01%	17	16
	Multisp & Scallop DAS	0.00%	0	0
	Neither	19.21%	182	2422

Table 133. Annual monkfish revenue in 1997 by gear and vessel size for vessels that targeted monkfish, but are not expected to qualify for monkfish limited access.

Gear	Vessel tonnage	Monkfish revenue compared to total revenue	Average monkfish revenue per trip	Total DAS on monkfish trips
Fish Trawl	0-4 GRT	0.19%	267	16
	5-50 GRT	7.48%	86	1987
	51-100 GRT	1.83%	90	467
	101-150 GRT	0.09%	49	40
	151+ GRT	0.16%	46	81
Gillnet	0-4 GRT	0.49%	223	50
	5-50 GRT	47.02%	486	2214
	51-100 GRT	11.99%	7833	35
	101-150 GRT	0.00%	0	0
	151+ GRT	0.00%	0	0
Scallop Dredge	0-4 GRT	0.00%	0	1
	5-50 GRT	2.51%	1638	35
	51-100 GRT	0.00%	0	0
	101-150 GRT	0.15%	159	22
	151+ GRT	2.50%	3171	18
Scallop Trawl	0-4 GRT	0.00%	0	0
	5-50 GRT	0.00%	0	0
	51-100 GRT	0.00%	0	0
	101-150 GRT	0.00%	0	0
	151+ GRT	0.01%	207	1
Longline	0-4 GRT	0.00%	<1	39
	5-50 GRT	0.02%	<1	800
	51-100 GRT	0.02%	2	195
	101-150 GRT	0.00%	<1	54
	151+ GRT	0.00%	0	0
Other	0-4 GRT	0.00%	<1	508
	5-50 GRT	9.59%	93	2361
	51-100 GRT	11.35%	746	348
	101-150 GRT	4.59%	220	478
	151+ GRT	0.03%	2	309

Unlike Table 133 that summarizes a vessel's dependence on the monkfish fishery, Table 134 illustrates the dependence of gear sectors on monkfish. Gillnet vessels depend on monkfishing for a much larger portion of their revenue than any other gear. Gillnet vessels are however among the most diversified vessels in terms of species landed and thus may be better able to switch to alternate fisheries. Otter trawls also are quite diversified and thus, as a group, may be the least affected in this set of 308 vessels. Scallop dredges and trawls depend on monkfish more heavily than do otter trawls and also have fewer alternatives. Given their heavy reliance of scallops and the currently proposed severe cutbacks in scallop landings, these gears are likely to be very hard hit by the combination of regulations in monkfish and scallops.

Table 134. Annual monkfish revenue in 1997 by gear and target species for vessels that targeted monkfish, but are not expected to qualify for monkfish limited access.

Gear	Contribution to total revenues (percent)				
	Monkfish	Ten large mesh groundfish	Sea scallops	Small mesh groundfish	Other species
Fish Trawl	6.8	25.1	1.7	18.9	47.5
Scallop Dredge	9.1	0.2	90.5	0	0.1
Gillnet	45.7	22.8	0	0.1	31.4
Scallop Trawl	4.6	0	95.4	0	0
Longline	0	10.7	0	0	89.3
Other	5.7	3.4	1.5	0	89.3

7.1.7.2.1.2 Vessels that landed monkfish during the four-year qualification period, but are not expected to qualify

There are 1,216 vessels that landed at least one pound of monkfish between February 28, 1991 and February 27, 1995, but are not expected to qualify for monkfish limited access. Many of these vessels landed monkfish as bycatch when targeting other species. Most of these vessels are small and mid-sized, generally within the 5-50 GRT category but split between the 31-45 ft. and the 61-100 ft. groupings (Table 135 and Table 136). As noted above, many vessels in the Northeast region are between 5 and 50 GRT.

Table 135. Vessels by length that landed monkfish during February 28, 1991 to February 27, 1995 and are not expected to qualify for monkfish limited access.

Vessel length[39]	Number of Vessels	Percent
0-30 ft	37	3.1
31-45 ft	487	41.4
46-60 ft	217	18.5
61-100 ft	412	35.1
101+ ft	22	1.9
Total	1175	100

[39] No vessel length data are available for 41 vessels that landed monkfish during the four-year qualification period.

Table 136. Vessels by tonnage that landed monkfish during February 28, 1991 to February 27, 1995 and are not expected to qualify for monkfish limited access.

Tonnage[40]	Number of Vessels	Percent
0-4 GRT	28	2.4
5-50 GRT	618	52.6
51-100 GRT	255	21.7
101-150 GRT	171	14.6
151+ GRT	103	8.8
Total	1175	100

The largest aggregations of the 1,216 vessels that would fail to qualify for monkfish limited access are found in Massachusetts, Maine, Virginia, New Jersey and New York (Table 137). For individual ports (Table 138), most vessels are home-ported in Boston, Chatham, New Bedford, Gloucester in Massachusetts; Belford, Cape may and Point Pleasant in New Jersey; Hampton, Newport News, Norfolk, and Seaford in Virginia; and Montauk and New York City in New York. Among these vessels, no single port in Maine stands out. Rather, there are groups of small Downeast ports with a fairly regular distribution, each having a few permits. In addition, in a port-by-port examination Rhode Island suddenly gains in importance with Point Judith. New Hampshire and North Carolina are similar to Maine, in that no one port stands out but a number of smaller ports area all affected. The vessels in this category have landings in their homeport 46% of the time, and in their home state 71% of the time **?** below the average reported in the Section 5.4.5.5.

Table 137. Location of 1,216 vessels that landed monkfish during the qualification period, but are not expected to qualify for monkfish limited access.

Home port state	Number of vessels	Primary port state	Number of vessels
CT	0	CT	10
DE	9	DE	5
FL	17	FL	14
MA	454	MA	403
MD	12	MD	24
ME	131	ME	200
NC	60	NC	71
NH	40	NH	52
NJ	72	NJ	118
NY	105	NY	93
PA	34	PA	
RI	42	RI	69
VA	112	VA	105
WV	12	WV	
Other	12	Other	11
Unknown	104	Unknown	41

[40] No vessel length data are available for 41 vessels that landed monkfish during the four-year qualification period.

Table 138. Port distribution for 1,216 vessels that landed monkfish during the qualification period, but are not expected to qualify for monkfish limited access. Ports with the majority of vessels are bold-faced and ports with less than three vessels are not shown. Source: 1997 NER permit data.

State	Port	Home ports listed by non-qualifying vessels	Primary ports listed by non-qualifying vessels
CT	Stonington		7
DE	Wilmington	5	
FL	Miami	7	
MA	**Boston**	**201**	**8**
	Beverly	7	26
	Chatham	**26**	**43**
	Gloucester	**73**	**94**
	Harwich		4
	Harwichport	4	10
	Hull	3	4
	Hyannis	7	9
	Marblehead	4	6
	New Bedford/Fairhaven	**46**	**90**
	Newburyport	3	12
	Pigeon Cove		3
	Plymouth	7	12
	Provincetown	7	12
	Rockport	7	5
	Salisbury	3	3
	Sandwich	3	11
	Saugus		3
	Scituate	11	22
	Wellfleet		3
MD	Ocean City	11	23
ME	Boothbay	4	5
	Boothbay Harbor		8
	Cundys Harbor		9
	Cushing		3
	Harpswell	4	5
	Jonesport		4
	Kittery		3
	Mount Desert	3	3
	New Harbor		5
	Owls Head	3	
	Port Clyde	3	5
	Portland	21	42
	Rockland	5	6
	Saco	4	5
	South Bristol	3	
	Southwest Harbor	8	
	Sprucehead	4	4
	Stonington	3	8

State	Port	Home ports listed by non-qualifying vessels	Primary ports listed by non-qualifying vessels
	Vinalhaven		3
	Winter Harbor	3	4
NC	Atlantic	3	
	Beaufort-Morehead	8	11
	Belhaven	5	4
	Englehard		3
	Hobucken	3	3
	Lowland	7	7
	New Bern	4	3
	Oriental	4	7
	Swan Quarter	3	4
	Vandemere	4	7
	Wanchese	5	15
NH	Hampton	8	12
	Portsmouth	12	17
	Rye	3	7
	Seabrook	13	13
NJ	Atlantic City	5	7
	Barnegat Light	6	11
	Belford	**11**	**20**
	Cape May	**23**	**36**
	Point Pleasant	**11**	**23**
	Point Pleasant Beach		3
	Wildwood	4	6
NY	Freeport		7
	Greenport	5	5
	Hampton Bays		10
	Montauk	**14**	**23**
	New York	**70**	**18**
	Point Lookout		3
	Shinnecock	5	18
PA	**Philadelphia**	**34**	
RI	Narragansett	3	4
	Newport	5	15
	Providence	4	
	Point Judith	**21**	**37**
VA	Chincoteague		6
	Hampton	**17**	**36**
	Newport News	**9**	**22**
	Norfolk	**78**	**14**
	Seaford		**23**
WV	Falling Waters	13	

For these vessels that are not expected to qualify for monkfish limited access, many have multispecies and/or scallop day-at-sea permits, and many also have tuna permits (Table 139). Of the 694 multispecies permits, 547 are limited access, as are 122 of the 662 scallop permits. All but 12 summer flounder permits and all the lobster permits are commercial, as are all but 3 of the squid-mackerel-butterfish permits. Many of these vessels hold multiple permits, though few hold any particular combination. Yet most of these fisheries are under increasing landings limits. If alternative fisheries are to be pursued, they will need to be non-traditional species for the most part. No federal permits are held by 338 of these vessels.

Table 139. Permits held during 1997 by vessels that are not expected to qualify for monkfish limited access and landed one or more pounds of monkfish during the four-year qualification period.

Permit categories	Northeast Region Permit Status	Number of vessels	Percent
Permit	Multispecies	694	57%
	Sea scallop	662	54%
	Summer flounder	397	33%
	Lobster	571	47%
	Squid/Mackerel/Butterfish	521	43%
	Scup	326	27%
	Black Sea Bass	253	21%
	Tuna	608	50%
Permit combinations (5 vessels or more)	Tuna only	32	3%
	All 8 permits	94	8%
	Multispecies, Lobster, Tuna	37	3%
	Multispecies, Scallop, Lobster, Squid/Mackerel/Butterfish, Tuna	68	6%
	Multispecies, Scallop, Lobster, Squid/Mackerel/Butterfish, Black sea bass, Scup, Summer flounder	31	3%
	Multispecies, Scallop, Lobster, Squid/Mackerel/Butterfish, Scup, Summer flounder, Tuna	44	4%
	Multispecies, Lobster, Scallop & Tuna	65	5%

Of the 1,216 vessels that are not expected to qualify, 18 targeted monkfish in 1994; 36 in 1995; 36 in 1996; and 30 in 1997 (Table 140). Thus, again, the vast majority of these vessels relied on monkfish for 10 percent or less of their income. The drop in targeting levels after the sudden rise is likely related to worsening resource conditions. Nonetheless, the targeting vessels, especially, will feel the impacts of non-qualification.

Table 140. Annual monkfish revenue compared to total revenue for vessels that landed monkfish during the four-year qualification period, but are not expected to qualify for monkfish limited access. Source: NMFS dealer data.

	Number of vessels			
	1994	**1995**	**1996**	**1997**
10%	664	581	503	470
20%	23	25	25	37
30%	11	13	6	11
40%	5	6	10	5
50%	1	8	7	4
60%	2	5	6	3
70%	2	4	2	5
80%		3	3	4
90%	4	3	5	3
100%	4	7	3	6
TOTAL	716	561	570	548

Scallop dredges that would not qualify for monkfish limited access had the highest average monkfish revenue per trip during 1991-1995 (Table 141 and Table 142). Vessels that used otter trawls had a relatively low per trip revenue but a very high number of trips. Gillnet vessels had intermediate characteristics. Most of these vessels hold either a multispecies or a scallop limited access permit? or both. Mid-sized otter trawls take a larger percentage of monkfish than do larger otter trawls but larger vessels have larger average trip revenues. Mid-sized (50-150 GRT) gillnets are the most dependent. For scallop dredges the dependence rises with vessel size. Thus, impacts vary according to both gear and vessel size.

Table 141. Annual monkfish revenue in 1997 by gear and limited access permit category for vessels that landed monkfish during the four-year qualification period, but are not expected to qualify for monkfish limited access.

Gear	Permits held in 1997	Percent of all monkfish revenues	Average monkfish revenue (dollars) per trip	Monkfish trips
Fish Trawl	Multisp. DAS Only	20.56%	71	15589
	Scallop DAS Only	1.72%	179	521
	Multisp & Scallop DAS	0.12%	16	415
	Neither	1.59%	44	1946
Gillnet	Multisp. DAS Only	37.97%	326	6296
	Scallop DAS Only	0.01%	8	54
	Multisp & Scallop DAS	0.00%	0	0
	Neither	9.15%	471	1052
Scallop Dredge	Multisp. DAS Only	0.37%	107	188
	Scallop DAS Only	18.51%	1408	711
	Multisp & Scallop DAS	0.06%	95	33
	Neither	0.63%	319	107
Scallop Trawl	Multisp. DAS Only	0.00%	0	0
	Scallop DAS Only	1.49%	302	267
	Multisp & Scallop DAS	0.05%	198	215
	Neither	0.01%	155	3
Longline	Multisp. DAS Only	0.17%	5	1891
	Scallop DAS Only	0.00%	7	5
	Multisp & Scallop DAS	0.00%	0	0
	Neither	0.02%	9	118
Other	Multisp. DAS Only	1.48%	13	6030
	Scallop DAS Only	0.28%	75	202
	Multisp & Scallop DAS	0.00%	0	1
	Neither	5.79%	72	4332

Table 142. Annual monkfish revenue in 1997 by gear and vessel size for vessels that landed monkfish during the four-year qualification period, but are not expected to qualify for monkfish limited access.

Gear	Vessel size in 1997	Percent of all monkfish revenues	Average monkfish revenue (dollars) per trip	Monkfish trips
Fish Trawl	0-4 GRT	0.10%	37	146
	5-50 GRT	8.68%	53	8944
	51-100 GRT	5.82%	48	6505
	101-150 GRT	5.68%	171	1799
	151+ GRT	3.71%	186	1077
Gillnet	0-4 GRT	0.45%	58	416
	5-50 GRT	34.63%	303	6190
	51-100 GRT	11.68%	896	705
	101-150 GRT	0.01%	28	12
	151+ GRT	0.37%	256	79
Scallop Dredge	0-4 GRT	0.00%	0	20
	5-50 GRT	0.00%	0	243
	51-100 GRT	0.61%	352	93
	101-150 GRT	8.46%	1146	399
	151+ GRT	10.51%	2001	284
Scallop Trawl	0-4 GRT	0.00%	0	0
	5-50 GRT	0.00%	0	0
	51-100 GRT	0.35%	237	81
	101-150 GRT	1.05%	321	177
	151+ GRT	0.15%	300	27
Longline	0-4 GRT	0.00%	<1	29
	5-50 GRT	0.11%	4	1742
	51-100 GRT	0.07%	19	198
	101-150 GRT	0.01%	21	30
	151+ GRT	0.00%	4	15
Other	0-4 GRT	0.00%	<1	318
	5-50 GRT	1.80%	16	5996
	51-100 GRT	2.25%	80	1527
	101-150 GRT	0.16%	9	952
	151+ GRT	3.35%	102	1772

Of the 1,216 that are not expected to qualify, the all gears are less dependent on monkfish than were the 308 who landed monkfish after the qualifying period. By definition, as non-qualifiers these vessels have a relatively low dependence on monkfish. Nonetheless, the general pattern of gillnets being the most dependent holds here as well. Vessels that used ?Other? gear are most likely to catch ?Other? species, followed by otter trawls and then longlines.

Table 143. Annual monkfish revenue in 1997 by gear and target species for vessels that targeted monkfish, but are not expected to qualify for monkfish limited access.

Gear	Contribution to total revenues (percentage)				
	Monkfish	Ten large mesh groundfish	Sea scallops	Small mesh groundfish	Other species
Fish Trawl	2.6%	16%	0.7%	10%	70%
Gillnet	23%	47%	0%	0.2%	29%
Scallop Dredge	5.3%	0.2%	95%	0%	0.1%
Scallop Trawl	2.3%	<0.1%	97%	0%	0.9%
Longline	0.2%	56%	0.1%	0.1%	44%
Other	1.0%	0.5%	0.6%	0.2%	98%

7.1.7.2.2 Days-at-Sea

Fishermen resisted the idea of days-at-sea restrictions to control fishing effort when it was initially suggested for the multispecies and sea scallop fisheries. The industry has however adjusted to this type of management ? as long as they can find a way to make a living under their days-at-sea allotments or by fishing in other fisheries. This is becoming more difficult to achieve, however, as days-at-sea allocations in groundfish and scallops continue to decline and other FMPs also impose lower quotas or more restrictive management measures. The impacts of scallop regulations are discussed in Section 7.1.11.1, for example.

7.1.7.2.2.1 Limited access qualified vessels whose annual allocation in year one is less than their 1997 days absent while fishing for monkfishing

This section discusses the distribution of those vessels that will be allocated fewer monkfish days-at-sea than the vessel fished for monkfish during 1997. If a vessel had more than 40 days absent on trips where monkfish was caught, it is included in this section. Days absent are 24-hour days from the vessel trip reports, not a vessel's reported multispecies or scallop days-at-sea. There are 674 such vessels.

These vessels are mostly between 31 and 100 feet. They cluster in the 31-45 foot and the 61-100 foot categories (Table 144). By tonnage, the majority are 5-50 GRT, with the next largest group being 51-100 and then 100-151 GRT. The smallest group is the 0-4 GRT fleet (Table 145). Thus, again, while the 5-50 GRT category is most impacted (i.e., has the most vessels in it) this is due to that size category being most prevalent in the fleet rather than to any portion of the measure differentially impacting that group. Larger vessels, in fact, may be more likely to find the allocated monkfish days-at-sea are more restrictive then their current fishing effort.

Table 144. Vessels by length that qualify for monkfish limited access and their total fishing effort in 1997 was greater than the proposed allocation of monkfish days-at-sea.

Vessel length[41]	Number of vessels	Percent
0-30 ft	12	1.9
31-45 ft	235	37.8
46-60 ft	129	20.8
61-100 ft	240	38.6
101+ ft	5	0.8
Total	621	100

[41] Vessel length information is unavailable for 53 vessels.

Table 145. Vessels by tonnage that qualify for monkfish limited access and their total fishing effort in 1997 was greater than the proposed allocation of monkfish days-at-sea

Tonnage[42]	Number of vessels	Percent
0-4 GRT	14	2.3
5-50 GRT	297	47.8
51-100 GRT	132	21.3
101-150 GRT	110	17.7
151+ GRT	68	11.0
Total	621	100

The majority of these vessels is from Massachusetts, followed by Maine, New Jersey and Rhode Island (Table 146). By port, the biggest grouping is in Boston, followed by Gloucester, and eventually by Point Judith.

Table 146. Vessels by home and primary states that qualify for monkfish limited access and their total fishing effort in 1997 was greater than the proposed allocation of monkfish days-at-sea. Port information is unavailable for 52 vessels.

Home port state	Number of vessels	Primary port state	Number of vessels
CT	3	CT	10
MA	303	MA	255
MD	4	MD	9
ME	50	ME	83
NC	27	NC	34
NH	28	NH	33
NJ	37	NJ	53
NY	78	NY	62
PA	12	PA	
RI	32	RI	49
VA	41	VA	32
Other	3	Other	2

Table 147. Port distribution for vessels by home and primary states that qualify for monkfish limited access and their total fishing effort in 1997 was greater than the proposed allocation of monkfish days-at-sea. Port information is unavailable for 52 vessels

State	Port	No. Vessels Listing as Home Port	No. Vessels Listing as Primary Port
CT	Stonington		8
MA	Beverly		3
	Boston	119	14
	Chatham	18	30
	Fall River	3	
	Gloucester	48	52
	Green Harbor	4	4
	Harwichport	3	5
	Hyannis		3

[42] Tonnage information is unavailable for 53 vessels.

State	Port	No. Vessels Listing as Home Port	No. Vessels Listing as Primary Port
	Marblehead	5	5
	New Bedford/Fairhaven	47	77
	Newburyport	3	6
	Plymouth		6
	Provincetown	6	8
	Rockport	3	
	Sandwich		7
	Scituate	7	10
	Westport		3
MD	Ocean City	4	9
ME	Boothbay		6
	Cundys Harbor	3	5
	Five Islands		4
	New Harbor		5
	Port Clyde		5
	Portland	10	21
	Saco		3
	South Bristol		6
	Southwest Harbor	3	
NC	Atlantic	4	
	Beaufort-Morehead	3	4
	Oriental		6
	Vandemere		3
	Wanchese	5	10
NH	Hampton	5	5
	Portsmouth	6	12
	Rye	4	6
	Seabrook	10	9
NJ	Belford	10	13
	Cape May	15	20
	Point Pleasant	5	11
	Wildwood	3	5
NY	Freeport		4
	Greenport	5	6
	Hampton Bays		6
	Montauk	9	13
	New York	54	9
	Shinnecock	3	
PA	Philadelphia	12	18
RI	Little Compton		3
	Narragansett		3
	Newport		8
	Point Judith	19	30
	Providence	3	
VA	Hampton	4	12
	Newport News		13
	Norfolk	32	3
	Seaford		4
WV	Falling Waters	4	

The more active monkfish vessels tend to have more traditional permits than other groups of vessels (Table 148). Relatively few active monkfish vessels have scup or black sea bass, for example. Of the 561 multispecies permits, 470 are limited access. Of the 524 scallop permits, 96 are limited access. Of the 363 summer flounder permits, 357 are commercial. Of the 466 lobster permits, all but one is commercial. There are 77 vessels with no federal permits. Increased effort in any of the permitted fisheries is likely to be minimal, given current stocks. For the 77 active monkfish vessels that would qualify for monkfish limited access, but have no other federal fisheries permit, species not currently managed by limited access are the most likely sources of alternative revenue.

Table 148. Permits held during 1997 by vessels that qualify for monkfish limited access and their total fishing effort in 1997 was greater than the proposed allocation of monkfish days-at-sea.

Permit Groupings	Northeast Region Permit Status	Number of Vessels	Percent
Individual permits	Multispecies	561	83%
	Sea scallop	524	78%
	Summer flounder	363	54%
	Lobster	465	69%
	Squid/Mackerel/Butterfish	423	63%
	Scup	291	43%
	Black Sea Bass	214	32%
	Tuna	422	63%
	None	77	11%
	All 8 permits	114	17%
Combinations	Multispecies, Lobster, Scallop, Tuna	51	8%
	Multispecies, Scallop, Lobster, Squid/Mackerel/Butterfish, Tuna	51	8%
	Multispecies, Scallop, Lobster, Squid/Mackerel/Butterfish, Black sea bass, Scup, Summer flounder	39	6%
	Multispecies, Scallop, Lobster, Squid/Mackerel/Butterfish, Scup, Summer flounder, Tuna	39	6%

The highest per trip revenues are found among scallop dredges, though they have relatively fewer trips where monkfish is caught (Table 149 and Table 150). This occurs because vessels that use scallop dredges often take trips that are twice as long as for vessels that use other fishing gear. Vessels that use otter trawls have the highest number of trips with monkfish landings. Vessels that use gillnets are intermediate. Most non-scallop vessels possess a limited access multispecies permit but not scallop and vice versa (Table 149). Larger vessels are the most dependent of this group, with per trip revenues rising by vessel tonnage among all gears (Table 150). Except for scallop dredges, however, the number of trips declines with vessel size.

Table 149. Annual monkfish revenue in 1997 by gear and limited access permit category for vessels that exceeded 40 days absent while fishing for monkfish during 1997 and are expected to qualify for monkfish limited access.

[Table omitted because of formatting problems]

Table 150. Annual monkfish revenue in 1997 by gear and vessel size for vessels that exceeded 40 days absent while fishing for monkfish during 1997 and are expected to qualify for monkfish limited access.

Gear	Tonnage	Proportion of total revenue from monkfish	Average monkfish revenue per trip	Total days absent on monkfish trips
Fish Trawl	0-4 GRT	0.01%	35	29
	5-50 GRT	5.26%	71	7281
	51-100 GRT	9.78%	149	6490
	101-150 GRT	19.50%	688	2798
	151+ GRT	15.04%	1410	1054
Gillnet	0-4 GRT	0.01%	7	176
	5-50 GRT	22.19%	395	5548
	51-100 GRT	4.98%	898	548
	101-150 GRT	0.28%	1000	28
	151+ GRT	0.00%	6	46
Scallop Dredge	0-4 GRT	0.00%	0	20
	5-50 GRT	0.00%	0	141
	51-100 GRT	0.21%	984	21
	101-150 GRT	5.72%	2039	277
	151+ GRT	15.61%	3247	475
Scallop Trawl	0-4 GRT	0.00%	0	0
	5-50 GRT	0.00%	0	0
	51-100 GRT	0.12%	272	43
	101-150 GRT	0.44%	551	79
	151+ GRT	0.08%	297	28
Longline	0-4 GRT	0.00%	<1	23
	5-50 GRT	0.05%	4	1376
	51-100 GRT	0.05%	39	135
	101-150 GRT	0.00%	0	2
	151+ GRT	0.00%	0	1
Other	0-4 GRT	0.00%	<1	193
	5-50 GRT	0.51%	13	3935
	51-100 GRT	0.02%	2	1384
	101-150 GRT	0.13%	29	457
	151+ GRT	0.00%	<1	415

While the 674 vessels that use will be fishing fewer than their 1997 days for monkfish, in general they are among the least dependent on monkfish as measured in revenue by gear. Vessels that use gillnets, however, are strongly dependent on monkfish revenues ? as well as on regulated groundfish.

Table 151. Annual monkfish revenue in 1997 by gear and target species for active monkfish vessels that will qualify for monkfish limited access

Gear	Contribution to Total Revenues (percentage)				
	Monkfish	Ten large mesh groundfish	Sea scallops	Small mesh groundfish	Other species
Fish Trawl	9.2	32.7	0.7	10.4	46.9
Scallop Dredge	9	0.4	90.5	0	0.2
Gillnet	24.2	50.7	0	0.3	24.9
Scallop Trawl	3.1	0.1	95.6	0	1.2
Longline	0.4	81.7	0.2	0.1	17.7
Other	0.5	2	1.5	0.4	95.6

7.1.7.2.2.2 Vessels determined by Regulatory Flexibility Analysis that will have significant impacts from the preferred alternative

There are 1,401 vessels that the RFA (Section 7.3) identified as economically impacted by the preferred alternative. Like other groups examined above, most vessels are either 31-45 feet or 61-100 feet (Table 152) and 5-50 GRT (Table 153).

Table 152. Vessels by length that would have significant economic impacts from the preferred alternative in year 4.

Length[43]	Number of vessels	Percent
0-30 ft	32	2.4
31-45 ft	448	33.9
46-60 ft	239	18.1
61-100 ft	585	44.3
101+ ft	16	1.2
Total	1320	100

Table 153. Vessels by size that will have significant economic impacts from the preferred alternative in year 4.

Tonnage[44]	Number of vessels	Percent
0-4 GRT	29	2.2
5-50 GRT	557	42.2
51-100 GRT	283	21.4
101-150 GRT	241	18.3
151+ GRT	210	15.9
Total	1320	100

The majority of economically impacted vessels are from Massachusetts, Maine, New York, New Jersey, followed by Rhode Island and Virginia (Table 154). By port (Table 155), the most affected are Boston, Gloucester, Chatham and New Bedford in Massachusetts; Portland in Maine; Cape May in New Jersey; Montauk and New York

[43] Vessel length information is unavailable for 81 vessels.
[44] Vessel tonnage information is unavailable for 81 vessels.

City in New York, Point Judith in Rhode Island, and Norfolk in Virginia. For the 1,328 vessels which listed both a home port and a primary port, 51% land in their home port. The home ports of these vessels are no more or less likely to be impacted than the average.

Table 154. Vessels by home and primary states that would have significant economic impacts from the preferred alternative in year 4.

Home Port State	Number of vessels	Primary Port State	Number of vessels
CT	8	CT	24
DE	6	DE	<3
FL	6	FL	<3
MA	615	MA	528
MD	9	MD	13
ME	98	ME	168
NC	54	NC	68
NH	54	NH	60
NJ	96	NJ	128
NY	137	NY	111
PA	35	PA	3
RI	80	RI	123
VA	95	VA	86
WV	17	WV	<3
Other	3	Other	2
Unknown	7	Unknown	1

Table 155. Port distribution for vessels by home and primary states that would have a significant economic impact from the preferred alternative in year 4.

State	Port	Number of vessels by home port	Number of vessels by primary port
CT	New London	4	6
	Stonington	3	17
DE	Wilmington	4	
FL	Miami	3	
MA	**Boston**	**254**	**35**
	Beverly	5	5
	Brant Rock	3	
	Chatham	**28**	**45**
	Gloucester	**86**	**102**
	Green Harbor		5
	Harwichport		7
	Hull	3	3
	Hyannis	5	6
	Manchester	4	
	Marblehead	5	6
	New Bedford/Fairhaven	**131**	**193**
	Newburyport	3	8
	Pigeon Cove	4	5
	Plymouth	3	6
	Provincetown	11	18
	Rockport	7	6

State	Port	Number of vessels by home port	Number of vessels by primary port
	Salisbury	3	
	Sandwich	3	6
	Swampscott		4
	Scituate	15	27
	Westport		5
MD	Ocean City	8	12
ME	Bremen	5	3
	Bar Harbor		4
	Bass Harbor		3
	Boothbay		4
	Boothbay Harbor		3
	Cundys Harbor	5	5
	Jonesport		3
	Kittery		5
	New Harbor		4
	Port Clyde	6	13
	Portland	**20**	**57**
	Saco		4
	South Bristol	4	14
	Southwest Harbor	5	4
	Stonington		5
	York		3
	York Harbor		3
NC	Atlantic	5	
	Bayboro		3
	Beaufort-Morehead	5	10
	Belhaven	4	
	Hobucken	3	
	Oriental		8
	Swan Quarter		3
	Vandemere	4	7
	Wanchese	13	22
NH	Hampton	7	8
	Portsmouth	18	26
	Rye	8	11
	Seabrook	15	14
NJ	Atlantic City		3
	Barnegat Light	19	29
	Belford	10	13
	Cape May	**34**	**44**
	Point Pleasant	12	22
	Point Pleasant Beach		3
	Sea Isle City	3	3
	Wildwood	4	5
NY	Freeport		3
	Greenport	5	8
	Hampton Bays		14
	Montauk	**19**	**30**
	New York	**91**	**12**

State	Port	Number of vessels by home port	Number of vessels by primary port
	Point Lookout		6
	Shinnecock	6	28
PA	Philadelphia	35	3
RI	Galilee		5
	Little Compton		5
	Narragansett	3	5
	Newport	7	18
	Providence	5	
	Point Judith	**44**	**75**
	Sakonnet Point		4
	Wakefield	7	
VA	Chincoteague		3
	Hampton	12	29
	Newport News	9	29
	Norfolk	**69**	**6**
	Seaford		19
WV	Falling Waters	17	

For vessels that are likely to have a significant economic impact by the preferred alternative in year 4, Norhteast species permits are also common (Table 156). Of the 1,145 Multispecies permits, 917 are limited access. Of the 730 Summer Flounder permits, 715 are commercial. Of the 958 Lobster permits, all but one are commercial. Of the 894 Squid-mackerel-butterfish permits, 884 are commercial. Of the 1091 sea scallop permits, 254 are limited access. All eight federal Northeast permits are held by 15 percent of this group, while 9 percent hold none of these permits. As before, substantial shifts in effort to any of the FMP species are unlikely given current stocks.

Table 156. Permits held during 1997 by vessels that would have a significant economic impact from the preferred alternative in year 4.

Permit Group	Permits	Number of Vessels	Percent
Individual permit	Multispecies	1145	81.73%
	Sea scallop	1091	77.87%
	Summer flounder	730	52.11%
	Lobster	958	68.38%
	Squid/Mackerel/Butterfish	894	63.81%
	Scup	545	38.90%
	Black Sea Bass	414	29.55%
	Tuna	918	65.52%
	None	125	8.9%
Combinations (50 vessels or more)	Multispecies, Scallop, Lobster, Squid/Mackerel/Butterfish	86	6.14%
	All 8 permits	209	14.92%
	Multispecies, Scallop, Lobster, Squid/Mackerel/Butterfish, Tuna	95	6.78%
	Multispecies, Scallop, Lobster, Squid/Mackerel/Butterfish, Black sea bass, Scup, Summer flounder	62	4.43%
	Multispecies, Scallop, Lobster, Squid/Mackerel/Butterfish, Scup, Summer flounder, Tuna	77	5.50%
	Multispecies, Lobster, Scallop & Tuna	75	5.35%

As might be expected from this group of vessels, the number of the 1401 that caught monkfish each year has increased since 1994. So, too has their level of dependence. More vessels derive larger percentages of their income from monkfishing ? although the majority still derive 10% or less of their total annual fishing income from monkfish

Table 157. Annual monkfish revenue compared to total revenue for vessels that would have a significant economic impact from the preferred alternative in year 4. Source: NMFS dealer data.

	Number of vessels			
	1994	**1995**	**1996**	**1997**
10%	760	761	793	883
20%	128	151	129	190
30%	47	59	49	63
40%	23	23	21	24
50%	14	18	22	18
60%	8	12	18	15
70%	8	8	11	13
80%	8	13	11	14
90%	9	12	10	16
100%	2	9	7	20
TOTAL	1007	1066	1071	1256

As would be expected given that these are vessels already identified as being economically impacted, the number of trips by each category of vessel is substantially higher than under any other grouping examined so far (Table 158 and Table 159). Otter trawls, gillnets, and scallop dredges with limited access DAS permits are the most impacted groups, though some vessels fishing with other gear are also affected (Table 158). By gear and size, trip dependence increases with vessel size, though number of trips ? except for scallop dredges ? decreases with size (Table 159). Scallop dredges, then, may be among the most impacted.

Table 158. Annual monkfish revenue in 1997 by gear and limited access permit category for vessels that would have a significant economic impact from the preferred alternative in year 4.

Gear	Permits held in 1997	Percent of all monkfish revenues	Average monkfish revenue (dollars) per trip	Monkfish trips
Fish Trawl	Multisp. DAS Only	44.69%	493	29566
	Scallop DAS Only	0.71%	272	784
	Multisp & Scallop DAS	2.82%	1025	898
	Neither	4.25%	399	3470
Gillnet	Multisp. DAS Only	17.22%	474	11849
	Scallop DAS Only	0.00%	8	54
	Multisp & Scallop DAS	0.00%	0	7
	Neither	5.10%	564	2956
Scallop Dredge	Multisp. DAS Only	0.17%	232	245
	Scallop DAS Only	15.92%	2568	2023
	Multisp & Scallop DAS	3.84%	3134	400
	Neither	0.33%	1760	61
Scallop Trawl	Multisp. DAS Only	0.01%	1756	1
	Scallop DAS Only	0.26%	313	276
	Multisp & Scallop DAS	0.09%	655	43
	Neither	0.00%	155	3
Longline	Multisp. DAS Only	0.05%	7	2274
	Scallop DAS Only	0.00%	4	27
	Multisp & Scallop DAS	0.00%	0	0
	Neither	0.01%	5	459
Other	Multisp. DAS Only	1.07%	32	10823
	Scallop DAS Only	0.06%	149	129
	Multisp & Scallop DAS	0.00%	<1	103
	Neither	3.40%	182	4816

Table 159. Annual monkfish revenue in 1997 by gear and tonnage for vessels that would have a significant economic impact from the preferred alternative in year 4.

Gear	Vessel size	Percent of all monkfish revenues	Average monkfish revenue (dollars) per trip	Monkfish trips
Fish Trawl	0-4 GRT	0.03%	62	152
	5-50 GRT	3.64%	93	12747
	51-100 GRT	8.25%	219	12283
	101-150 GRT	19.77%	1036	6225
	151+ GRT	20.77%	2048	3308
Gillnet	0-4 GRT	0.11%	76	465
	5-50 GRT	17.16%	431	12984
	51-100 GRT	4.89%	1299	1228
	101-150 GRT	0.12%	1013	39
	151+ GRT	0.06%	204	99
Scallop Dredge	0-4 GRT	0.00%	0	26
	5-50 GRT	0.18%	278	206
	51-100 GRT	0.60%	889	220
	101-150 GRT	4.35%	1749	811
	151+ GRT	15.15%	3371	1466
Scallop Trawl	0-4 GRT	0.00%	0	0
	5-50 GRT	0.00%	0	0
	51-100 GRT	0.07%	263	93
	101-150 GRT	0.26%	417	201
	151+ GRT	0.03%	287	29
Longline	0-4 GRT	0.00%	<1	55
	5-50 GRT	0.02%	3	2214
	51-100 GRT	0.03%	29	362
	101-150 GRT	0.00%	8	84
	151+ GRT	0.00%	4	15
Other	0-4 GRT	0.00%	<1	491
	5-50 GRT	2.31%	80	9360
	51-100 GRT	1.24%	112	3626
	101-150 GRT	0.40%	120	1080
	151+ GRT	0.59%	208	923

Otter trawl and gillnet vessels in this group of impacted vessels are more heavily dependent than others on both monkfish and regulated groundfish (Table 160), while scallop dredges and trawls are slightly less dependent on scallops. This would be expected given that, by definition, these vessels would be impacted more by the preferred alternative than other vessels.

Table 160. Annual monkfish revenue in 1997 by gear and target species for vessels that would have significant economic impacts from the preferred alternative in year 4.

Gear	Contribution to total revenues (percent)				
	Monkfish	Ten large mesh groundfish	Sea scallops	Small mesh groundfish	Other species
Fish Trawl	11	39.2	0.5	8.2	41
Gillnet	28.5	47.2	0	0.2	24.1
Scallop Dredge	8.3	0.3	91.2	0	0.2
Scallop Trawl	2.7	0.1	96	0	1.3
Longline	0.2	35.5	0.1	0	64.3
Other	4.6	2.1	1.5	0.5	91.3

7.1.7.2.3 Closed areas and seasons

Closed areas are an option, which generally make sense to fishermen, especially provided the areas are chosen for spawning or seasonal aggregations. To the extent that closing some areas allows for less restrictive days-at-sea allocations than would otherwise be necessary, closed areas could have a positive impact. The fact that the waters east of 72? 30? W longitude and south of 40? 10? N latitude (deepwater fishery) will be closed only in that a lower trip limit will apply from January 16 to October 14 is also a mitigating factor. That multispecies vessels cannot target monkfish in their 20-day blocks out of groundfishing may adversely impact some vessels, but should not impose a major burden overall. Vessels without multispecies or scallop limited access permits are somewhat more restricted in that they cannot fish in any area in the Gulf of Maine/Georges Bank or Southern New England regulated mesh areas that are not designated as an exempted monkfish fishery according to the multispecies regulations.

"[Nonetheless, c]losed areas, ... can disrupt the traditional annual round of fishermen by forcing a switch to different species or different gear, or to becoming a migrant worker [especially for small vessels]. Many factors will be involved in which of these choices is made. Level of community attachment will figure into whether or not migrant labor is chosen, with day fishermen and fishermen from close-knit rural or ethnic communities being less willing to leave home for long periods of time. (But many offshore fishermen would prefer to spend more, not less, time at home as it is.) Draggers will be less likely to choose different gear (Clay 1993)." There are also fewer alternative fisheries with established markets available in 1998 than in 1993.

7.1.7.2.4 Gear restrictions

The number of vessels using gillnets with large mesh has steadily increased since 1994 (Table 161). The vessels that use gillnets with mesh of 8-inches or more are those that are most dependent on monkfish. For all four years, monkfish landings only comprise less than 10% of the total weight landed for approximately 90% of vessels that use smaller meshes. Vessels that use larger meshes are much more evenly distributed into higher ranges.

Table 161. Frequency of gear use by mesh size and number of nets.

	1994	*1995*	*1996*	*1997*
Percent of all gillnets with mesh 8 in. or more	5%	26%	29%	31%
Percent gillnet vessels fishing more than 160 nets	19%	9%	12%	13%
Percnet of trawl vessels using mesh greater than 6 in.	2%	2%	4%	7%
Percent of scallop vessels using fishing gear with 10-12 in. mesh	1%	0%	0%	0%

Trawl mesh limits while under multispecies day-at-sea are the same as those already required under the Multispecies FMP and thus should impose no additional burden. Scallop vessels that have targeted monkfish with dredges would be affected by the preferred alternative because they could no longer target monkfish jointly with scallops.

7.1.7.2.5 Annual review and management framework adjustment procedure

An annual adjustment procedure increases flexibility and therefore aids fishermen in the long run. It also gives more opportunity for input from the industry. While experience with other similar mechanisms (e.g. the Multispecies framework adjustment procedure) shows that sometimes more restrictions are imposed in the annual adjustments, keeping the plan on target allows for faster rebuilding and ultimately greater profitability. Further, some adjustments under the multispecies plan have been increases, e.g., in the haddock trip limit. Thus, the presence of this mechanism is expected to have positive social impacts.

7.1.7.2.6 Closed Areas

Closed areas are not included in the proposed management measures at this time. The Councils could implement closed areas to conserve monkfish through a framework adjustment or to protect essential fish habitat through a plan amendment. The social impacts of these potential measures cannot be assessed until the parameters of the proposed closures are known, however.

7.1.7.2.7 Recreational Measures

No recreational management measures are proposed or contemplated at this time. Recreational landings of monkfish generally result from infrequent and accidental catches while fishing for other species. In most cases, anglers catch monkfish because they are unaware that they have hooked another species of fish and fail to reel in their catch. The hooked fish are sometimes sucked in by a monkfish before the lucky angler realizes he has a bite. If there is any impact on recreational fisheries caused by the proposed management measures, it will be that larger monkfish are more common and increase angler satisfaction.

7.1.7.3 Community Impacts

Community impacts overall are complicated by the interactions of monkfish regulations with recent and proposed regulations in the groundfish and scallop fisheries. It is obvious that there are large groupings of impacted vessels in several large ports such as Boston, Gloucester, New Bedford, Cape May, Norfolk. Mid-sized ports likely to feel impacts include Point Judith and Chatham. What is less obvious is that small aggregations of ports in rural areas of Maine, North Carolina and New Hampshire may also constitute communities for the purposes of this analysis.

Studies are currently underway which will assist in determining whether these aggregations meet the definition of fishing-dependent communities. In the interim, however, this document can only indicate the possibility of such a determination. In terms of gear types, gillnet vessels are generally the most heavily dependent on monkfish revenue as measured by the percentage this revenue constitutes of their entire annual revenue. However, gillnets are also the most diversified gear group in terms of the total number of species and fisheries which they target. This may offer them some opportunity for moving to alternate fisheries, though only non-traditional fisheries offer any real opportunity for growth at this time. Scallop dredges rely on monkfish for a relatively small portion of their annual revenue, generally 5-10 percent. However, with currently proposed scallop regulations drastically reducing available scallop DAS, the additional loss of this small but lucrative monkfish fishery may be of critical importance **?** especially to the largest dredge vessels. Given this, traditional scallop ports, including New Bedford and Norfolk, may be especially hard hit.

As financial burdens increase, strain is placed on the social and cultural fabric of communities. Fishermen put out of work may lose self esteem. Spouses may need to return to work or to work extra hours. These can lead to increases in marital tension, alcohol and drug abuse, and domestic violence. White (1993) noted that where crews are of mixed racial or ethnic backgrounds minorities may be the first to be dropped if crews are cut to save costs. In crews composed of family members, individual crew members may accept lower wages during times of financial stress, thus allowing the vessel to continue operating. This practice has its limits however where most members of the extended family are involved in fishing, because the number of people who can be relied on for financial support during the slow period is also diminished.

There are two sources of information to evaluate the importance of the monkfish fishery on communities. For a community, economic activity can be measured by the total payroll that for all industries. While total payroll is only a fraction of the total economic activity for a single company or for many industries, the remaining economic activity is often spent for goods and services, generating payroll in other industries and companies. In the aggregate, however, total payroll often makes up a significant fraction of the total economic activity of all industries combined. Certain exceptions exist when a single company or industry whose source of supplies is outside the area under consideration dominates the economic activity of a community (here defined at the county level).

For the fishing industry, much of the economic activity is captured by the ex-vessel price and wages paid to dockside workers. When payroll information includes all income of crew and owners, it can be an acceptable measure of economic activity generated by the fishery. For the monkfish fishery, however, most of the processing occurs at sea and the product is shipped rapidly to foreign markets. Most of the dockside processing consists of preparation of the product for shipping. Monkfish are either dressed at sea (removing the head and viscera, retaining the liver as a separate product) or are landed head-on, liver-in. These products are repackaged dockside and shipped to countries in Europe and Asia. As such, the total ex-vessel value represents the majority of economic activity generated by the monkfish fishery.

The impacts of the preferred and non-preferred alternatives were evaluated at the county level and compared to total business payroll. For larger ports and communities with a more diverse economy and commercial fishery, the proposed alternatives would have a smaller, marginal impact than in a community that relies heavily on fishing. Within the monkfish fishery, the Council estimated the total impact within the monkfish fishery by applying the proposed management measures for limited access, day-at-sea limits, and trip limits and calculating the net change in total ex-vessel revenue. This evaluation is made by comparing the "Total Monkfish Fishery Revenue" to the "Adjusted Monkfish Fishery Revenue". As an upper bound on the impact that the proposed management measures would have on the fishing industry and total economic activity, these impacts were scaled up by the ratio between "Total Fishing Payroll" and the "Total Monkfish Fishery Revenue". This procedure overestimates the total impact on the economic activity of commercial fisheries in each community because the "Total Fishing Payroll" includes wages and salaries generated by other fisheries. The groundfish fishery, for example, dominates fishing payroll in Gloucester, MA, while the payroll in New Bedford is dominated by the scallop industry. The impacts on "Total Fishing Payroll" could be apportioned by the ratio between monkfish revenue and total fishery revenue, but the current method is acceptable for placing and upper bound on the expected impacts.

Table 162 to Table 164 summarize the proportion of economic generated by fishing and by the monkfish fishery in coastal communities. All coastal counties with known major commercial fishing ports are included from Maine to North Carolina. Business and payroll data were derived from the U.S. Census (http://www.census.gov/datamap/www/index.html) for calendar year 1995 and fishery revenue data were summarized from NMFS dealer data during 1995-1996. Monkfish prices were assumed to remain constant at 1995-1996 levels, since the size distribution of landed fish could not be estimated. Although there is a distinct trend in liver and whole-fish prices during the early to mid-1990's (Figure 18), recent prices have fallen due to the Asian currency devaluation. Future prices therefore are uncertain and the past trend may not continue through the four-year period encompassed by this analysis.

7.1.7.3.1 Economic activity due to fishing

The total business payroll and total fishery payroll vary widely across the coastal counties (Table 162). Counties with the largest populations have the largest total payroll and tend to have the lowest fraction of the payroll derived from the fishing industry. Examples of these large, populous counties are Nassau, NY ($15.6 billion), Suffolk, NY ($13.0 billion), and Middlesex, NJ ($11.3 billion). Total business income is often boosted because of government activity. New London, CT has a naval shipyard, for example, boosting its total payroll to $2.9 billion. The top counties in terms of fishing payroll are also Nassau, NY ($203 million), Suffolk, NY ($163 million), and Middlesex, NJ ($152 million). In percentage terms, however, the top counties tend to be less populous and have lower total business payrolls. These top fishing counties are Pamlico, NC (3.2%), Knox, ME (2.3%), Carteret, NC (2.1%), Washington, ME (1.5%), and Dare, NC (1.5%). New Bedford, a port that processes a considerable portion of its landings, ranked ninth in terms of total fishery payroll which made up 0.9 percent of the total business payroll. The total fishing payroll underestimates the true importance of the fishery to these communities, because the total fishing payroll does not capture all sources of income derived from fishing. This analysis could be improved by comparing these data with the total ex-vessel revenue for all landings by county.

The top counties in terms of 1995-1996 monkfish revenue were Bristol, MA ($70 million), Essex, MA ($61 million), Rockingham, NH ($53 million), Washington, RI ($17 million) and Cumberland, ME ($16 million). These correspond with ports with large commercial fishing fleets: New Bedford (scallops), Gloucester (groundfish), Portsmouth (groundfish), Pt. Judith (groundfish, whiting, and squid), and Portland (groundfish). All of these ports have a fleet of vessels that target monkfish. As a percentage of total payroll, the monkfish revenue ranks highest in the counties of York, VA (6.7%), Washington, RI (2.0%), Rockingham, RI (2.0%), Bristol, MA (1.6%), and Hampton, VA (1.4%). These rankings are different than those for total monkfish revenue because of the relationship between monkfish fishery revenue, total fishing payroll, and total business payroll. In York, VA, for example, the monkfish revenue from bycatch in the scallop fishery is large in comparison to the total fishing payroll, perhaps underestimated for this county. In Washington County, RI on the other hand, fishing is a large proportion of total economic activity and in terms of monkfish revenue the county is ranked fourth.

7.1.7.3.2 Preferred alternative

The estimated economic impacts of the preferred alternative are shown for year 1 (Table 162), year 2 (Table 163), and year 4 (Table 164). These years represent major changes in the management measures that would affect economic activity and the impacts on communities. These impacts vary across communities because the reductions in day-at-sea and trip limits affect qualifying and non-qualifying vessels in differing amounts. Thus a port with a higher proportion of vessels that qualify for monkfish limited access could be affected more (relative to other communities) in year 4 than in year 1. Communities that have a greater share of landings from monkfish bycatch would be affected more (relative to other communities) in year 1 and less so in year 4. These impacts, throughout the mortality reduction and rebuilding phases of the proposed management program, are highest in communities that have higher numbers of vessels that were active participants in the monkfish fishery during the four-year qualification period. Once stock recovery occurs, the Council expects that additional days will be allocated for a directed fishery and prosecuted by vessels that qualify for limited access. The communities with the highest transitional impacts will therefore also be the ports that will benefit the most from the expected benefits of the preferred alternative.

The impacts of the preferred and non-preferred alternatives could not be estimated at this level of detail for coastal counties in NC. NC does not participate in the NMFS dealer reports and therefore individual trip records were not available for analysis. NC was also unable to provide the Councils with this data due to confidentiality restrictions. Although fishing contributes to a larger share of the economy of communities in NC than in many of the other communities, quantitative assessment of the impacts in NC were not possible. Other sections of the EIS and FMP show the amount of monkfish that are landed in NC and how many vessels that would qualify for monkfish limited access who list their homeport as NC. Based on preliminary review of existing data for this FMP, there are some vessels with NC homeports that qualify for monkfish limited access. Many of these vessels, however, have summer flounder permits. Vessels may use state landings data to qualify for monkfish limited access and small gillnet vessels may be able to qualify with this data. Many in the fishery, however, began targeting monkfish after the control date and would not therefore qualify. Failure for vessels to qualify in NC could have a significant impact on economic activity for these communities.

Communities are affected more in year 1 if the vessels that targeted monkfish during 1995 and 1996 fail to qualify for monkfish limited access. These vessels fail to qualify because many began fishing after the control date, rather than due to the characteristics of the fleet in the port that do not match the proposed qualification criteria well. Small vessels that could be characteristic of a community could qualify with only 7,500 pounds tail-weight, rather than the 50,000 pounds tail-weight required of large vessels. On the other hand, the incidental catch of monkfish in the multispecies fishery enable a large proportion of active groundfish vessels to qualify, regardless of vessel size. The ports that have the highest impact, therefore, are dominated by ports that have few groundfish vessels and have fleets that entered the monkfish fishery later than in other areas. Counties with the highest impacts on the total monkfish revenue (Table 162) include Worcester, MD (17%), Hampton, VA (17%), Newport, RI (16%), Ocean, NJ (9%) and Nassau, NY (8%). The expected impacts on total business payroll is very small (0.1 percent or less) in any port, owing to the diverse nature of the economy in ports where the monkfish impacts are greatest.

In years 2 and 3, the directed fishery trip limits would begin (provided that the year 1 measures are not expected to achieve the year 2 mortality targets). The ports with the greatest impacts (Table 163) are therefore those that were impacted by the qualification criteria and those that have the higher number of active monkfish vessels that also qualify for limited access. Counties with the highest impacts on the monkfish fishery include Newport, RI (23%), Worcester, MD (18%), Hampton, VA (18%), Monmouth, NJ (16%), and Norfolk, MA (11%). The impacts for the latter two counties rose because they include the ports of Belmar/Brielle, NJ and Boston, MA. Both ports have a high number of vessels that qualify for limited access, the former comprised of gillnet vessels and the latter dominated by vessels that trawl for monkfish in deepwater. Although the total impact in year 2 increased from $12.4 million in year 1 (Table 162) to $16.3 million in years 2 and 3 (Table 163), the impact on total business payroll does not exceed 0.2 percent.

In year 4, there would be no days-at-sea allocations for monkfish limited access vessels, unless the measures in year 2 and 3 fail to stop overfishing. This reduction considerably increases the impacts on the monkfish fishery, especially in communities that rely on monkfish landings more than other ports with more diverse fisheries. The other change that would take place in year 4 is a reduction in the bycatch trip limits for multispecies and scallop vessels. Ports with a large multispecies or scallop fleet will also have higher impacts as a result. Counties with the highest impacts (Table 164) include Knox, ME (42%), Norfolk, MA (41%), Lincoln, ME (41%), Newport, RI (41%), and Cumberland, ME (40%). The estimated impacts on the total business payroll is highest in Knox County, ME, having a port (Rockland) that relies heavily on the groundfish fishery and mixed-species fishery in the Gulf of Maine. In fact, Maine counties lead the list of counties with the highest impacts because the bycatch trip limits in year 4 become effective for all multispecies vessels in the Gulf of Maine. Previous to that, the bycatch trip limits only apply to vessels that fail to qualify for monkfish limited access. The total impact on the monkfish fishery is expected to increase to $58 million, from $16.3 million in year 2.

Table 162. Community impacts of the preferred alternative from May 1, 1999 to April 30, 2000. Blank cells indicate that data are unavailable to estimate the impact of monkfish regulations.

County	Primary port	Total Business Payroll ($1,000)	Total Fishing Payroll ($1,000)	Total Monkfish Fishery Revenue ($1,000)	Adjusted Monkfish Fishery Revenue ($1,000)	Percent of Total Business Payroll	Impact on Total Business Payroll	Impact on Monkfish Fishery Revenue
New London	Stonington	2,870,795	2,548	-	-	0.0%		
CT Total		2,870,795	2,548	-	-	0.0%		
Barnstable	Chatham/ Hyannis	1,364,637	15,493	7,242	7,047	0.5%	0.0%	2.7%
Bristol	New Bedford	4,350,302	38,033	70,033	64,633	1.6%	0.1%	7.7%
Essex	Gloucester	7,184,086	59,873	61,063	60,583	0.8%	0.0%	0.8%
Norfolk	Boston	8,910,450	69,170	5,629	5,249	0.1%	0.1%	6.8%
Plymouth	Plymouth/ Scituate	3,318,230	23,282	3,122	3,039	0.1%	0.0%	2.7%
MA Total		25,127,705	205,851	138,338	132,263	0.6%	0.0%	4.4%
York	Kennebunkport	899,908	2,833	-	-	0.0%		
Cumberland	Portland	3,228,216	18,361	16,352	15,649	0.5%	0.0%	4.3%
Hancock	Ellsworth	324,400	3,099	678	673	0.2%	0.0%	0.7%
Washington	Machias	152,855	2,245	-	-	0.0%		
Knox	Rockland	270,489	6,227	1,205	1,157	0.4%	0.1%	4.0%
Sagadohoc	Bath	411,871	-	-	-	0.0%		
Waldo	Belfast	97,025	274	-	-	0.0%		
Lincoln	South Bristol	153,230	1,139	1,062	1,058	0.7%	0.0%	0.4%
ME Total		5,537,994	34,178	19,297	18,537	0.3%	0.0%	3.9%
Carteret	Beaufort	237,475	5,057	-	-	0.0%		
Dare	Wanchese	166,277	2,406	-	-	0.0%		
Pamlico	New Bern	24,950	801	-	-	0.0%		
NC Total		428,702	8,264	-	-	0.0%		
Rockingham	Portsmouth	2,626,851	12,814	52,653	51,570	2.0%	0.0%	2.1%
NH Total		2,626,851	12,814	52,653	51,570	2.0%	0.0%	2.1%
Cape May	Cape May	-	11,071	9,583	9,444			1.5%
Middlesex	Monmouth	11,285,568	151,873	-	-	0.0%		
Monmouth	Belmar/Brielle	5,372,860	16,601	5,466	5,154	0.1%	0.0%	5.7%
Ocean	Pt. Pleasant	2,222,721	12,355	4,054	3,698	0.2%	0.0%	8.8%
NJ Total		18,881,149	191,900	19,103	18,296	0.1%	0.0%	4.2%
Nassau	Freeport	15,577,565	203,151	646	594	0.0%	0.1%	8.0%
Suffolk	Moriches/ Shinnecock	13,030,047	163,394	9,578	9,185	0.1%	0.1%	4.1%
NY Total		28,607,612	366,545	10,224	9,779	0.0%	0.1%	4.4%
Newport	Newport/ Tiverton	552,936	4,928	4,645	3,900	0.8%	0.1%	16.0%
Washington	Pt. Judith	714,177	8,407	17,196	16,737	2.4%	0.0%	2.7%
RI Total		1,267,113	13,335	21,841	20,637	1.7%	0.1%	5.5%
York	Seaford	112,562	500	7,506	7,503	6.7%	0.0%	0.0%
Hampton	Hampton	835,189	348	11,932	9,924	1.4%	0.0%	16.8%
Newport News	Newport News	1,883,746	1,457	14,456	14,429	0.8%	0.0%	0.2%
Norfolk	Norfolk	2,710,234	1,301	-	-	0.0%		
VA Total		5,541,731	3,606	33,894	31,856	0.6%	0.0%	6.0%
Worcester	Ocean City	320,204	973	2,617	2,173	0.8%	0.1%	17.0%
MD Total		320,204	973	-	-	0.0%		
Grand Total		91,209,856	840,014	295,350	282,938	0.3%	0.0%	4.2%

Table 163. Community impacts of the preferred alternative from May 1, 2000 to April 30, 2002. Blank cells indicate that data are unavailable to estimate the impact of monkfish regulations.

County	Primary port	Total Business Payroll ($1,000)	Total Fishing Payroll ($1,000)	Total Monkfish Fishery Revenue ($1,000)	Adjusted Monkfish Fishery Revenue ($1,000)	Percent of Total Business Payroll	Impact on Total Business Payroll	Impact on Monkfish Fishery Revenue
New London	Stonington	2,870,795	2,548	-	-	0.0%		
CT Total		2,870,795	2,548	-	-	0.0%		
Barnstable	Chatham/ Hyannis	1,364,637	15,493	7,242	6,972	0.5%	0.0%	3.7%
Bristol	New Bedford	4,350,302	38,033	70,033	63,195	1.6%	0.1%	9.8%
Essex	Gloucester	7,184,086	59,873	61,063	60,403	0.8%	0.0%	1.1%
Norfolk	Boston	8,910,450	69,170	5,629	5,019	0.1%	0.1%	10.8%
Plymouth	Plymouth/ Scituate	3,318,230	23,282	3,122	3,039	0.1%	0.0%	2.7%
MA Total		25,127,705	205,851	138,338	130,570	0.6%	0.0%	5.6%
York	Kennebunkport	899,908	2,833	-	-	0.0%		
Cumberland	Portland	3,228,216	18,361	16,352	15,429	0.5%	0.0%	5.6%
Hancock	Ellsworth	324,400	3,099	678	673	0.2%	0.0%	0.7%
Washington	Machias	152,855	2,245	-	-	0.0%		
Knox	Rockland	270,489	6,227	1,205	1,157	0.4%	0.1%	4.0%
Sagadohoc	Bath	411,871	-	-	-	0.0%		
Waldo	Belfast	97,025	274	-	-	0.0%		
Lincoln	South Bristol	153,230	1,139	1,062	1,058	0.7%	0.0%	0.4%
ME Total		5,537,994	34,178	19,297	18,317	0.3%	0.0%	5.1%
Carteret	Beaufort	237,475	5,057	-	-	0.0%		
Dare	Wanchese	166,277	2,406	-	-	0.0%		
Pamlico	New Bern	24,950	801	-	-	0.0%		
NC Total		428,702	8,264	-	-	0.0%		
Rockingham	Portsmouth	2,626,851	12,814	52,653	51,363	2.0%	0.0%	2.5%
NH Total		2,626,851	12,814	52,653	51,363	2.0%	0.0%	2.5%
Cape May	Cape May	-	11,071	9,583	9,416			1.7%
Middlesex	Monmouth	11,285,568	151,873	-	-	0.0%		
Monmouth	Belmar/Brielle	5,372,860	16,601	5,466	4,582	0.1%	0.0%	16.2%
Ocean	Pt. Pleasant	2,222,721	12,355	4,054	3,626	0.2%	0.1%	10.6%
NJ Total		18,881,149	191,900	19,103	17,624	0.1%	0.1%	7.7%
Nassau	Freeport	15,577,565	203,151	646	594	0.0%	0.1%	8.0%
Suffolk	Moriches/ Shinnecock	13,030,047	163,394	9,578	9,160	0.1%	0.1%	4.4%
NY Total		28,607,612	366,545	10,224	9,754	0.0%	0.1%	4.6%
Newport	Newport/ Tiverton	552,936	4,928	4,645	3,578	0.8%	0.2%	23.0%
Washington	Pt. Judith	714,177	8,407	17,196	16,056	2.4%	0.1%	6.6%
RI Total		1,267,113	13,335	21,841	19,634	1.7%	0.1%	10.1%
York	Seaford	112,562	500	7,506	7,503	6.7%	0.0%	0.0%
Hampton	Hampton	835,189	348	11,932	9,847	1.4%	0.0%	17.5%
Newport News	Newport News	1,883,746	1,457	14,456	14,419	0.8%	0.0%	0.3%
Norfolk	Norfolk	2,710,234	1,301	-	-	0.0%		
VA Total		5,541,731	3,606	33,894	31,769	0.6%	0.0%	6.3%
Worcester	Ocean City	320,204	973	2,617	2,160	0.8%	0.1%	17.5%
MD Total		320,204	973	-	-	0.0%		
Grand Total		91,209,856	840,014	295,350	279,031	0.3%	0.1%	5.5%

Table 164. Community impacts of the preferred alternative after May 1, 2002. Blank cells indicate that data are unavailable to estimate the impact of monkfish regulations.

County	Primary port	Total Business Payroll ($1,000)	Total Fishing Payroll ($1,000)	Total Monkfish Fishery Revenue ($1,000)	Adjusted Monkfish Fishery Revenue ($1,000)	Percent of Total Business Payroll	Impact on Total Business Payroll	Impact on Monkfish Fishery Revenue
New London	Stonington	2,870,795	2,548	-	-	0.0%		
CT Total		2,870,795	2,548	-	-	0.0%		
Barnstable	Chatham/ Hyannis	1,364,637	15,493	7,242	6,634	0.5%	0.1%	8.4%
Bristol	New Bedford	4,350,302	38,033	70,033	53,975	1.6%	0.2%	22.9%
Essex	Gloucester	7,184,086	59,873	61,063	38,223	0.8%	0.3%	37.4%
Norfolk	Boston	8,910,450	69,170	5,629	3,318	0.1%	0.3%	41.1%
Plymouth	Plymouth/ Scituate	3,318,230	23,282	3,122	3,009	0.1%	0.0%	3.6%
MA Total		25,127,705	205,851	138,338	98,832	0.6%	0.2%	28.6%
York	Kennebunkport	899,908	2,833	-	-	0.0%		
Cumberland	Portland	3,228,216	18,361	16,352	9,859	0.5%	0.2%	39.7%
Hancock	Ellsworth	324,400	3,099	678	625	0.2%	0.1%	7.8%
Washington	Machias	152,855	2,245	-	-	0.0%	#DIV/0!	#DIV/0!
Knox	Rockland	270,489	6,227	1,205	700	0.4%	1.0%	41.9%
Sagadohoc	Bath	411,871	-	-	-	0.0%		
Waldo	Belfast	97,025	274	-	-	0.0%		
Lincoln	South Bristol	153,230	1,139	1,062	632	0.7%	0.3%	40.5%
ME Total		5,537,994	34,178	19,297	11,816	0.3%	0.2%	38.8%
Carteret	Beaufort	237,475	5,057	-	-	0.0%		
Dare	Wanchese	166,277	2,406	-	-	0.0%		
Pamlico	New Bern	24,950	801	-	-	0.0%		
NC Total		428,702	8,264	-	-	0.0%		
Rockingham	Portsmouth	2,626,851	12,814	52,653	51,061	2.0%	0.0%	3.0%
NH Total		2,626,851	12,814	52,653	51,061	2.0%	0.0%	3.0%
Cape May	Cape May	-	11,071	9,583	9,240			3.6%
Middlesex	Monmouth	11,285,568	151,873	-	-	0.0%		
Monmouth	Belmar/Brielle	5,372,860	16,601	5,466	4,357	0.1%	0.1%	20.3%
Ocean	Pt. Pleasant	2,222,721	12,355	4,054	3,533	0.2%	0.1%	12.9%
NJ Total		18,881,149	191,900	19,103	17,130	0.1%	0.1%	10.3%
Nassau	Freeport	15,577,565	203,151	646	581	0.0%	0.1%	10.1%
Suffolk	Moriches/ Shinnecock	13,030,047	163,394	9,578	9,111	0.1%	0.1%	4.9%
NY Total		28,607,612	366,545	10,224	9,692	0.0%	0.1%	5.2%
Newport	Newport/ Tiverton	552,936	4,928	4,645	2,762	0.8%	0.4%	40.5%
Washington	Pt. Judith	714,177	8,407	17,196	14,309	2.4%	0.2%	16.8%
RI Total		1,267,113	13,335	21,841	17,071	1.7%	0.2%	21.8%
York	Seaford	112,562	500	7,506	7,501	6.7%	0.0%	0.1%
Hampton	Hampton	835,189	348	11,932	9,376	1.4%	0.0%	21.4%
Newport News	Newport News	1,883,746	1,457	14,456	14,121	0.8%	0.0%	2.3%
Norfolk	Norfolk	2,710,234	1,301	-	-	0.0%		
VA Total		5,541,731	3,606	33,894	30,998	0.6%	0.0%	8.5%
Worcester	Ocean City	320,204	973	2,617	2,120	0.8%	0.1%	19.0%
MD Total		320,204	973	-	-	0.0%		
Grand Total		91,209,856	840,014	295,350	236,600	0.3%	0.2%	19.9%

7.1.7.3.3 Non-preferred alternatives

The Non-preferred alternatives 3a and 3b differ from the preferred alternative because of more conservative qualification criteria for monkfish limited access. The major difference in impacts would occur during years 2 and 3, since in year 4 no days-at-sea would be allocated to monkfish limited access vessels. In year 4, there is therefore little difference from the preferred alternative. A complementary analysis of monkfish impacts for non-preferred alternatives 3a and 3b shows how the different qualification criteria would change the impacts on communities. In general, more conservative qualification criteria translates into more vessels fishing under the monkfish bycatch trip limits and discards therefore increase. These additional discards translate in loss of yield from the fishery, increasing costs to communities. Some communities would furthermore have fewer vessels that would qualify for monkfish limited access and the qualification criteria would therefore have a greater effect on economic activity from fishing. These effects, however, differ on by community because the two non-preferred alternatives differ in how they treat qualification for vessels that hold a limited access permit for multispecies.

The expected impacts on communities are greatest for non-preferred alternative 3a (Table 165) in Newport, RI (23%), Worcester, MD (18%), Norfolk, MA (13%), Monmouth, NJ (10%), and Nassau, NY (9%). Compared to the preferred alternative, these qualification criteria and the trip limits associated with this alternative reduce the impacts on Hampton, VA, but generally affect the same communities. The relative impacts on the monkfish fishery are slightly less in Newport, RI, about the same for Worcester, MD, 20 percent higher for Norfolk, VA, 50 percent less for Monmouth, NJ, and slightly higher for Nassau, NY. Accounting for the proportion of the fishing economy contributed by monkfish and the proportion of the total economy contributed by economic activity due to fishing, the impacts on total business payroll are minimal (less than 0.2 percent) for all communities. Over all communities included in this analysis, the non-preferred alternative 3a has a cost of $14.0 million vs. $16.4 million for the preferred alternative.

For non-preferred alternative 3b (Table 166), the highest impacts on the monkfish fishery would occur in Newport, RI (22%), Worcester, MD (17%), Monmouth, NJ (16%), Norfolk, MA (14%), and Bristol, MA (11%). Like non-preferred alternative 3b, the highest impacts involve the same communities as the preferred alternative but the impacts are significantly lower for Hampton, VA. The relative impacts on the monkfish fishery are slightly less for Newport, RI, about the same for Worcester, MD, about the same for Monmouth, NJ, and higher for Norfolk, MA and Bristol, MA. Compared to the total economic activity accounted for by total business payroll, the expected costs to communities is expected to be low (less than 0.2 percent of total business payroll). Over all communities included in this analysis, non-preferred alternative 3b has a cost of $18.3 million vs. $16.4 million for the preferred alternative.

Non-preferred alternatives 1 and 4 were not analyzed at this level of detail, because the Councils rejected them due to the high aggregate costs to the industry and the high amount of discards that would be created by the lower bycatch trip limits. Industry opposed non-preferred alternative 1 because it managed by seasonal quotas and would create unacceptable discards when the season closed due to filling the quota. Other mortality reduction schedules were also considered in the aggregate but the distributional aspects and the effects would be the same across communities as the preferred alternative.

Table 165. Community impacts of non-preferred alternative 3a between May 1, 2000 and April 30, 2001. Blank cells indicate that data are unavailable to estimate the impact of monkfish regulations.

County	Primary port	Total Business Payroll ($1,000)	Total Fishing Payroll ($1,000)	Total Monkfish Fishery Revenue ($1,000)	Adjusted Monkfish Fishery Revenue ($1,000)	Percent of Total Business Payroll	Impact on Total Business Payroll	Impact on Monkfish Fishery Revenue
New London	Stonington	2,870,795	2,548	-	-	0.0%		
CT Total		2,870,795	2,548	-	-	0.0%		
Barnstable	Chatham/ Hyannis	1,364,637	15,493	7,268	6,999	0.5%	0.0%	3.7%
Bristol	New Bedford	4,350,302	38,033	89,176	82,156	2.0%	0.1%	7.9%
Essex	Gloucester	7,184,086	59,873	61,344	60,699	0.9%	0.0%	1.1%
Norfolk	Boston	8,910,450	69,170	5,645	4,934	0.1%	0.1%	12.6%
Plymouth	Plymouth/ Scituate	3,318,230	23,282	3,122	3,039	0.1%	0.0%	2.7%
MA Total		25,127,705	205,851	157,788	149,854	0.6%	0.0%	5.0%
York	Kennebunkport	899,908	2,833	-	-	0.0%		
Cumberland	Portland	3,228,216	18,361	17,386	16,366	0.5%	0.0%	5.9%
Hancock	Ellsworth	324,400	3,099	653	649	0.2%	0.0%	0.6%
Washington	Machias	152,855	2,245	-	-	0.0%		
Knox	Rockland	270,489	6,227	1,205	1,155	0.4%	0.1%	4.1%
Sagadohoc	Bath	411,871	-	-	-	0.0%		
Waldo	Belfast	97,025	274	-	-	0.0%		
Lincoln	South Bristol	153,230	1,139	1,062	1,048	0.7%	0.0%	1.3%
ME Total		5,537,994	34,178	20,306	19,218	0.4%	0.0%	5.4%
Carteret	Beaufort	237,475	5,057	-	-	0.0%		
Dare	Wanchese	166,277	2,406	-	-	0.0%		
Pamlico	New Bern	24,950	801	-	-	0.0%		
NC Total		428,702	8,264	-	-	0.0%		
Rockingham	Portsmouth	2,626,851	12,814	51,829	51,363	2.0%	0.0%	0.9%
NH Total		2,626,851	12,814	51,829	51,363	2.0%	0.0%	0.9%
Cape May	Cape May	-	11,071	12,885	12,667			1.7%
Middlesex	Monmouth	11,285,568	151,873	-	-	0.0%		
Monmouth	Belmar/Brielle	5,372,860	16,601	8,517	7,709	0.2%	0.0%	9.5%
Ocean	Pt. Pleasant	2,222,721	12,355	4,246	3,916	0.2%	0.0%	7.8%
NJ Total		18,881,149	191,900	25,648	24,292	0.1%	0.1%	5.3%
Nassau	Freeport	15,577,565	203,151	655	598	0.0%	0.1%	8.7%
Suffolk	Moriches/ Shinnecock	13,030,047	163,394	9,579	9,206	0.1%	0.0%	3.9%
NY Total		28,607,612	366,545	10,234	9,804	0.0%	0.1%	4.2%
Newport	Newport/ Tiverton	552,936	4,928	4,745	3,663	0.9%	0.2%	22.8%
Washington	Pt. Judith	714,177	8,407	17,243	15,920	2.4%	0.1%	7.7%
RI Total		1,267,113	13,335	21,988	19,583	1.7%	0.1%	10.9%
York	Seaford	112,562	500	7,641	7,638	6.8%	0.0%	0.0%
Hampton	Hampton	835,189	348	11,809	11,581	1.4%	0.0%	1.9%
Newport News	Newport News	1,883,746	1,457	17,962	17,910	1.0%	0.0%	0.3%
Norfolk	Norfolk	2,710,234	1,301	-	-	0.0%		
VA Total		5,541,731	3,606	37,412	37,129	0.7%	0.0%	0.8%
Worcester	Ocean City	320,204	973	2,629	2,172	0.8%	0.1%	17.4%
MD Total		320,204	973	-	-	0.0%		
Grand Total		91,209,856	840,014	325,205	311,243	0.4%	0.0%	4.3%

Table 166. Community impacts of non-preferred alternative 3b between May 1, 2000 and April 30, 2001. Blank cells indicate that data are unavailable to estimate the impact of monkfish regulations.

County	Primary port	Total Business Payroll ($1,000)	Total Fishing Payroll ($1,000)	Total Monkfish Fishery Revenue ($1,000)	Adjusted Monkfish Fishery Revenue ($1,000)	Percent of Total Business Payroll	Impact on Total Business Payroll	Impact on Monkfish Fishery Revenue
New London	Stonington	2,870,795	2,548	-	-	0.0%		
CT Total		2,870,795	2,548	-	-	0.0%		
Barnstable	Chatham/ Hyannis	1,364,637	15,493	7,529	7,235	0.6%	0.0%	3.9%
Bristol	New Bedford	4,350,302	38,033	79,116	70,243	1.8%	0.1%	11.2%
Essex	Gloucester	7,184,086	59,873	63,748	62,813	0.9%	0.0%	1.5%
Norfolk	Boston	8,910,450	69,170	8,615	7,378	0.1%	0.1%	14.4%
Plymouth	Plymouth/ Scituate	3,318,230	23,282	3,134	3,033	0.1%	0.0%	3.2%
MA Total		25,127,705	205,851	150,393	140,291	0.6%	0.1%	6.7%
York	Kennebunkport	899,908	2,833	-	-	0.0%		
Cumberland	Portland	3,228,216	18,361	16,798	15,434	0.5%	0.0%	8.1%
Hancock	Ellsworth	324,400	3,099	740	735	0.2%	0.0%	0.7%
Washington	Machias	152,855	2,245	-	-	0.0%		
Knox	Rockland	270,489	6,227	1,205	1,153	0.4%	0.1%	4.3%
Sagadohoc	Bath	411,871	-	-	-	0.0%		
Waldo	Belfast	97,025	274	-	-	0.0%		
Lincoln	South Bristol	153,230	1,139	1,237	1,216	0.8%	0.0%	1.7%
ME Total		5,537,994	34,178	19,980	18,538	0.4%	0.0%	7.2%
Carteret	Beaufort	237,475	5,057	-	-	0.0%		
Dare	Wanchese	166,277	2,406	-	-	0.0%		
Pamlico	New Bern	24,950	801	-	-	0.0%		
NC Total		428,702	8,264	-	-	0.0%		
Rockingham	Portsmouth	2,626,851	12,814	52,948	51,659	2.0%	0.0%	2.4%
NH Total		2,626,851	12,814	52,948	51,659	2.0%	0.0%	2.4%
Cape May	Cape May	-	11,071	10,176	9,987			1.9%
Middlesex	Monmouth	11,285,568	151,873	-	-	0.0%		
Monmouth	Belmar/Brielle	5,372,860	16,601	5,466	4,598	0.1%	0.0%	15.9%
Ocean	Pt. Pleasant	2,222,721	12,355	4,345	3,917	0.2%	0.1%	9.9%
NJ Total		18,881,149	191,900	19,987	18,502	0.1%	0.1%	7.4%
Nassau	Freeport	15,577,565	203,151	742	685	0.0%	0.1%	7.7%
Suffolk	Moriches/ Shinnecock	13,030,047	163,394	11,486	10,975	0.1%	0.1%	4.4%
NY Total		28,607,612	366,545	12,228	11,660	0.0%	0.1%	4.6%
Newport	Newport/ Tiverton	552,936	4,928	5,202	4,039	0.9%	0.2%	22.4%
Washington	Pt. Judith	714,177	8,407	19,503	17,729	2.7%	0.1%	9.1%
RI Total		1,267,113	13,335	24,705	21,768	1.9%	0.1%	11.9%
York	Seaford	112,562	500	7,506	7,501	6.7%	0.0%	0.1%
Hampton	Hampton	835,189	348	10,523	10,152	1.3%	0.0%	3.5%
Newport News	Newport News	1,883,746	1,457	15,349	15,277	0.8%	0.0%	0.5%
Norfolk	Norfolk	2,710,234	1,301	-	-	0.0%		
VA Total		5,541,731	3,606	33,378	32,930	0.6%	0.0%	1.3%
Worcester	Ocean City	320,204	973	2,631	2,176	0.8%	0.1%	17.3%
MD Total		320,204	973	-	-	0.0%		
Grand Total		91,209,856	840,014	313,619	295,348	0.3%	0.1%	5.8%

7.1.8 Summary

7.1.8.1 Yield benefits of delayed harvest

7.1.8.1.1 Biological effects

The most common technique historically used in fisheries management is to delay the age at entry to the fishery via minimum size limits to increase yield in weight from a given level of recruitment. SAW-14 (NMFS 1992) concluded that substantial gains in yield per recruit could be achieved by increasing the age at first capture. A size limit, therefore, has the potential for increasing yield and also would prevent markets for small monkfish tails from developing.

Gains in yield could be substantial in the monkfish fishery if small fish are released alive. The conservation benefits that would result from the minimum size limit depends largely on the fishermen's ability to avoid small monkfish while seeking the primary specie. High discard mortality for monkfish has been observed when otter trawls were used inshore. Preliminary results of research conducted by Massachusetts Division of Marine Fisheries have indicated discard survival rates ranging from 8 to 57 percent (J. Harris, pers. comm.). Most of these samples were from fish captured by trawls in relatively shallow water. Discard mortality in offshore waters is likely to be significantly higher. The intended effect of a minimum size limit is, therefore, not to increase yield per recruit and spawning potential through discard survival, but rather to cause fishermen to avoid areas with high concentrations of small fish. Many fishermen have indicated that there are patchy areas that have small monkfish. The fishermen felt it would be possible to avoid these areas, but it would be difficult to pre-define closed areas to reduce the catch of small fish.

The historical industry practice of landing parts (i.e., tails, cheeks, livers and belly flaps) further complicates the imposition of minimum size limits, but has been greatly simplified by defining the size limit as the length between two anatomical reference points that almost always appear on landed tails.

Rationale for an 11 inches minimum tail size: The Councils considered a range of size limits, especially as compared to maturation, to make this recommendation. According to data collected on research surveys, 50% of females become sexually mature between 41.5 and 47.7 cm (10¾ - 12½ inches tail length) in the Gulf of Maine, and between 38.8 and 46.7 cm (10 and 12¼ inches tail length) south of Georges Bank (U.S. Dept. of Commerce 1992, Table SC3). On the other hand, there is a significant amount of catches and landings of monkfish with tails measuring less than 12 inches (Figure 37 and Figure 38). In Portland, ME over 45% of the landings consisted of monkfish tails less than 12 inches. Monkfish tails less than 11 inches comprised 20 percent of the landings.

Assuming that monkfish recruit to the commercial fishery when they reach 13.7 inches (9 inches tail length) and other factors do not change, these fish would require 12 months to reach legal size with a 12 inch limit and 8 months with an 11 inch limit (Table 106). In other words under a 12-inch limit, landings could immediately decline 40% and would begin to recover over 12 months to former levels. Under an 11-inch minimum tail size, landings could decline 20% and take 8 months to recover. Although larger size limits might be more desirable over the long term, the Councils believe that a 12-inch size limit would be too restrictive, and therefore recommend an 11-inch size limit. Fifty percent of monkfish measuring 16_ inches total length will yield an 11-inch tail if cut using normal practices (see Recommended enforcement). The total size limit being recommended, therefore, is 17 inches to ensure that nearly all landings of whole monkfish exceed the 11-inch tail length. The whole number would also reduce the burden of monitoring compliance.