

## **6.0 Fishery Impact Statement**

The implementation of any new fishery management changes the environment for fishermen that target the regulated resource, but it can also result in changes for those in fisheries for other species. In many instances, the imposition of regulations to restrict effort and reduce fishing mortality forces fishing effort onto other species. In the complex fishing environment of the Northeast Region, where there are thousands of boats participating in a wide variety of fisheries, the impacts of new regulations can have unexpected consequences that complicate fisheries management. This section takes a broad overview of fisheries in the region and attempts to gauge the interactions between herring management and other fisheries.

Obviously, vessels that will be most affected by the management measures in this plan are those vessels that have been fishing for herring in recent years. The vast majority of reported landings in recent years have been by a small group of less than 20 vessels. Over 180 other vessels land herring and will also be impacted by these regulations. Because herring is not overfished and the resource is underutilized, the regulations will not reduce overall landings and revenues. Some of the measures, however, will result in a redistribution in fishing effort. The impacts of the management plan on the herring fishery are described in the Environmental Impact Statement (section 7.1). An important part of the fishery is the communities that it supports. The ports that are most dependent on herring are identified in section E.6.4.2.4. A discussion of the impacts of the management measures and the alternatives on fishing communities is included in section E.7.4 and Appendix I.

A second group of vessels that will be affected by the plan are those vessels that choose to enter the herring fishery as an alternative to fishing on stocks that are subject to increasing restrictions or regulations. Adoption of this plan will constrain their activity. Finally, the plan may have impacts on other fisheries in the northeast region that are described below.

### **6.1 Permit Status**

Prior to plan implementation, there is no requirement for all vessels fishing for herring to possess a federal herring permit. This complicates determining the permit status of those vessels that fish for herring. While many vessels currently landing herring possess other federal permits or letters of authorization, there are some vessels that may fish only in state waters that do not. This complicates any analysis of the permits that are held by herring fishermen. Only those vessels that have another federal permit are required to submit vessel trip reports and can be readily identified in the permit, vessel trip report, and dealer weighout databases.

In an attempt to describe the options available to herring vessels to participate in other fisheries, the 20 vessels that reported landing the most herring 1996 and 1997 were identified in the vessel trip report database. (This database does not include a small number of vessels that fish only in state waters, including some vessels that land a large amount of herring, and so the results cannot be directly related to other analyses in this document that includes those vessels.) In 1996, these twenty vessels accounted for approximately 80 percent of total landings. In 1997, the top 20 vessels accounted for about 71 percent of total landings. Some of the remaining landings were by

vessels that were not required, or did not file, vessel trip reports. Because of changes from year to year, there were 28 total vessels that met this criteria. Three of those vessels surrendered their permits in the Fishing Vessel Capacity Reduction Program for the Northeast Multispecies fishery. The remaining 25 vessels possess the permits listed in Table 5. All of these vessels can be expected to request a herring permit after the plan is implemented. In addition to these vessels, there are approximately 180 – 260 other vessels that reported landing herring in 1996 or 1997 that can be expected to request a permit.

Because the fishery will be open access, a herring permit can be requested for any new or existing vessel (subject to the size and horsepower restrictions). Some vessels, however, are more likely than others to request a herring permit. As a pelagic fish, herring is most likely to be harvested by mobile gear vessels. While foreign fleets targeted herring with gillnets in the 1960's and there is a gillnet fishery for herring in Canada, mesh size restrictions in other fisheries and marine mammal concerns make it unlikely for a herring gillnet fishery to develop in U.S. waters. Because herring is a low value/high volume fishery, smaller vessel classes that do not have adequate hold capacity are also unlikely to enter the fishery. These vessels may still request a permit, however, to preserve the option of forfeiting other permits subject to size upgrading restrictions and obtaining a larger vessel to target herring. Finally, vessels that are already fishing in the mid-Atlantic or New England areas are most likely to enter this fishery. Using these rough guidelines, the number vessels that are likely to request a herring permit can be estimated. As of March 18, 1998, there were 5,358 commercial permit holders (excluding tuna permits) in the Northeast Region of NMFS. Disregarding those vessels that only possess lobster or hook gear permits, there are approximately 2,300 current permit holders that may apply for herring permits. Some of these vessels may not have landed any fish in recent years.

Table 6 – Northeast Region fishing permits held by vessels that targeted herring during 1996 – 1997, for the top 20 vessels in reported landings for each of those years. Permit status is of October 1, 1998. NMFS NER permit data.

Permit	Number of Vessels
Mackerel Open Access	20
Scallop, general category	20
Lobster, commercial	16
Fluke, limited access	15
Multispecies, fleet DAS	15
Scup	15
Ocean quahog	14
Surf clam	13
<i>Loligo</i> , moratorium	8
Black sea bass, limited access	13
<i>Illex</i> , moratorium	8
Squid, incidental catch	5
Multispecies, hand-gear	2
Scallop, limited access, full time	2
Multispecies, non-regulated open access	2
Multispecies, individual DAS	2
Multispecies, scallop	1
Multispecies, combination	1
Total vessels	25

## **6.2 American Lobster Fishery**

American lobsters support the northeast region's most valuable fishery, worth more than a quarter of a billion dollars in 1997, accounting for 27% of the region's total fishery revenues. Eighty percent of the resource is harvested in state waters. Lobster will be managed under the provisions of the Atlantic Coastal Fisheries Cooperative Management Act, with the Commission developing regulations for state waters and complementary regulations for federal waters implemented by NMFS. Lobsters are presently overfished, and both the Commission and NMFS are in the process of implementing management plans to address concerns that the resource is dangerously close to collapse. For federal waters, NMFS will propose a series of trap limits and reductions that will take effect over the course of the years 1999 and 2000. Trawl vessels are currently limited in the amount of lobsters they can land per trip, a provision that NMFS has proposed to carry over into its new management plan (NMFS 1998b).

Lobsters are fished with both fixed gear (traps) and mobile gear (trawls). In December of 1997, there were 3,153 vessel owners with federal lobster permits, with about 900 for trawl gear. For federal permit holders, in 1996 the average length for trap vessels was 39 feet. Mobile gear vessels were larger, averaging 58 feet, with over 400 boats exceeding 60 feet in length. About two-thirds of the federal permit holders in 1997 held at least one other federal permit (NMFS 1998b). Of these vessels, the ones most able to enter the herring fishery are the trawl vessels, because of their gear and size. It is unlikely that many trap vessels would be able to enter the herring both because of their size.

The most important connection between the herring and lobster fisheries is the reliance of the lobster industry on herring for bait. As described in section E.6.4.3.1, lobster bait is currently the primary market for herring. Significant changes in the lobster fishery could result in corresponding changes in the demand for herring, which would affect development of the fishery.

## **6.3 Northeast Multispecies Fishery**

The management unit for the Northeast Multispecies fishery includes 12 species: cod, haddock, pollock, redfish, white hake, yellowtail flounder, windowpane flounder, winter flounder, American plaice, witch flounder, Atlantic halibut, and ocean pout. An amendment is being prepared that will add whiting, red hake and offshore hake to the species complex. This fishery is managed through an extensive program of measures that include gear restrictions, closed areas, and limits on fishing effort through a days-at-sea program. Under the Northeast Multispecies Plan, purse seine and mid-water trawl herring vessels in the Gulf of Maine and Georges Bank areas are required to obtain a letter of authorization to use small mesh gear to fish for herring. In addition, some fishermen have used Multispecies Plan provisions designed to permit whiting fishing to target herring using bottom trawls.

Eight of the species in this complex are overfished and the stocks are being rebuilt through management action. Amendment 7 to the Northeast Multispecies Plan accelerated the days-at-sea effort reduction program, added new closed areas in the Gulf of Maine, and eliminated most open-access permit categories for regulated multispecies. More recently, Framework 25 was submitted in February, 1998 to reduce cod trip limits and expand the use of closed areas in the

Gulf of Maine, increase the haddock trip limit, postpone implementation of the VMS, and require a raised footrope trawl in Small Mesh Areas 1 and 2 in the Gulf of Maine.

SAW 27 reported that of the regulated species, Gulf of Maine cod is near collapse. Additional closures in the Gulf of Maine have been proposed to protect a declining Gulf of Maine cod stock. Framework 26 adopted closures for February, March, and April of 1999. Framework 27 will be submitted recommended closures and other measures for the fishing year beginning May 1, 1999.

#### **6.4 Sea Scallop Fishery**

Scallops are caught by approximately 200 full-time scallop fishing vessels with dredge and trawl gear throughout New England and the mid-Atlantic region. An additional 77 vessels have part-time or occasional category scallop permits. The fishery is managed through a combination of limited entry permit restrictions, days-at-sea controls, closed areas, gear restrictions, and limits on crew size.

The Atlantic sea scallop current stock biomass is at a low level, has high fishing mortality rates, and is showing signs of a lack of significant recruitment. Amendment 7 to the Atlantic Sea Scallop Fishery Management Plan proposes a schedule to rebuild the resource over a ten year period. The proposed action will reduce days-at-sea for full-time scallop vessels from 120 days in 1999 to only 34 days in 2004. The estimated economic impacts of these reductions is that full-time scallop vessels will not be able to maintain their economic viability during the first six- to nine years of the program. While the difference between the number of days necessary to meet costs is small in 1999, beginning in 2000 the average break-even days-at-sea requirement far exceeds the full-time allocation. Full-time vessels earn over 90% of their revenues from scallop fishing. These boats have limited opportunities to participate in other fisheries. 194 vessels have multispecies permits, 127 have mackerel permits, and only 33 have multispecies permits, limiting possible alternative fisheries. Under the proposed Monkfish Fishery Management Plan, they will only be able to land monkfish when using a scallop day-at-sea, losing a traditional supplement to scallop revenues (NEMFC 1998c).

Two possible fisheries that scallop vessel may choose to enter include the mackerel fishery and the herring fishery. Scallop dredge vessels would have to rig to use either purse seine or mid-water trawl gear to enter these fisheries. The higher ex-vessel revenue received for mackerel may make that fishery more attractive to scallop owners. There has, however, been some interest in the New Bedford fishing industry to develop the ability to process and distribute herring.

#### **6.5 Squid, Mackerel, Butterfish Fishery**

Fisheries for two species of squid (*illex* and *loligo*) and mackerel provided total revenues of approximately \$30.1 million in 1997 (*loligo* \$26.5 million, *illex* \$6.1 million, mackerel \$9.5 million) (MAFMC 1998a). All three of these fisheries are managed using an annual quota system. There are also minimum mesh sizes for vessels fishing for *loligo*. While the mackerel fishery remains an open access fishery, the two squid fisheries both have a limited access system in place. In September, 1997, a control date was published for the mackerel fishery, but the qualification criteria to receive a permit has not yet been established.

There are some similarities between the herring fishery and these fisheries. The fisheries for *illex* and mackerel also are dominated by a small group of vessels. In 1993, one-third (18) of the vessels that reported landing *illex* accounted for 99% of the total catch. Just over one-fifth (58) of the vessels that reported landing mackerel accounted for 95% of the catch. While there is a larger group of participants in the *loligo* fishery, 90% of the catch was still landed by one-third of the vessels. The primary gear for squid vessels is the bottom otter trawl. Vessels fishing for mackerel – primarily with mid-water trawls - also catch a considerable amount of herring. Table E.24 and Table E.25 summarize individual trips that landed both herring and mackerel in 1996 and 1997. Another indication of this close link between the two fisheries is that an examination of weighout data from 1992 showed that herring is the second most common species (by weight) for those trips that landed more than 10,000 pounds of mackerel, accounting for 13% of the total pounds landed, but only 2.2% of the total value (MAFMC 1994). Herring was not among the top five species, either by weight or by value, in either of the squid fisheries. Finally, much like the herring resource, the mackerel resource is under-utilized. U.S. and Canadian landings totaled about 34,800 mt in 1996 with an estimated ABC of 1,175,00 mt. Total U.S. landings in 1997 were essentially unchanged from 1996 at 17,142 mt (MAFMC 1998a).

The average ex-vessel price per pound for Atlantic mackerel increased from 13 cents in 1996 to 28 cents in 1997. NMFS attributes the increase value of the frozen at-sea product delivered by the New Jersey and Rhode Island freezer trawler fleet (NMFS 1998a). Much like herring, mackerel landings are dependent on market conditions. According to the MAFMC, the major supplier of mackerel to world markets has traditionally been Norway. "A lack of mackerel in the North Sea area and the potential for future mackerel TAC reductions are providing opportunities for U.S. producers to place additional exports of mackerel in the international market" (MAFMC 1998a). Recent financial instability in eastern European and Asian countries, however, may force a revision to this assessment.

## **6.6 Whiting**

Vessels fishing for whiting with small mesh bottom trawls catch also catch herring. Some vessels use the whiting small mesh bottom trawl exemption to target herring during specific times of the year. The Council is preparing an amendment to the Northeast Multispecies plan that will establish regulations for fishing for whiting, red hake, and offshore hake. The plan proposes an additional moratorium permit on commercial vessels fishing for whiting, with several different permit categories and qualification criteria. Proposed measures will include a minimum mesh size of 3-inches to retain up to 30,000 pounds of whiting/offshore hake. Vessels using a 2.5 inch mesh will be allowed a whiting/offshore hake limit of 7,500 pounds, and vessels choosing to use less than a 2.5 inch mesh will be allowed a whiting/offshore hake possession limit of 3,500 pounds. In the Gulf of Maine/Georges Bank area, whiting fishing will be allowed on Cultivator Shoals during the period June 15 through September 30. Fishing will be allowed in two defined small mesh areas; Small Mesh Area 1 will be open to fishing from July 15 to November 15, and Small Mesh Area 2 will be open from January 1 through June 30. (Additional closed areas adopted under the Northeast Multispecies Plan may restrict some of these possible fishing times.)

The proposed measures include three permit categories. Vessels with a limited access small mesh

multispecies permit will be allowed to possess from 3,500 pounds to 30,000 pounds of whiting/offshore hake, depending on the mesh size in use. Vessels with a limited access small mesh multispecies possession limit permit will be restricted to 2,500 pounds of small mesh multispecies. Vessels with an open access multispecies incidental catch permit will be restricted to 100 pounds of small mesh multispecies. Preliminary analysis shows that an estimated 414 vessels will qualify for the limited access small mesh multispecies permit, and 992 will qualify for the limited access small mesh multispecies possession limit permit. Another 1,500 vessels could still qualify for a small mesh multispecies permit either by obtaining a current multispecies permit or through the appeal process.

Some vessels that fish under existing whiting programs target herring on a small number of trips. These vessels supply bait herring to local lobster or tuna boats. The exact number of these vessels is unknown. In 1997, there were 100 vessels that caught 823 mt of herring, while also landing 4,000 mt of whiting. The most herring reported by an individual vessel was just over 30 mt, but the average was only 3.5 mt (see section E.7.3.4.3).

## **6.7 Monkfish**

The Monkfish FMP was submitted for approval in September, 1998. This FMP establishes a limited access program for monkfish, trip limits for monkfish days-at-sea, minimum size limits, mandatory time out of the fishery, and limits on gillnets. It also establishes management areas for setting biological reference points and implementing differing management measure. The plan is designed to rebuild monkfish to more than the 1965-1981 stock biomass average within ten years. This will be accomplished by reducing fishing mortality, which will result in a change in a negative median net present value of gross revenues until 2017 (NEFMC 1998).

Most monkfish landings are as bycatch in the groundfish and scallop fisheries. Landings from all gear types increased to record high levels, due to increasing directed fishing effort through the mid- to late 1980's. In addition, some gillnet fishermen that used to target groundfish have begun to target monkfish. Monkfish was a significant part of scallop vessel revenues, exceeding 30 percent of total trip revenue on ten percent of scallop dredge trips. Approximately 600 vessels are expected to qualify for monkfish limited access permits. About 1,215 vessels that landed at least one pound of monkfish during the qualification period will not automatically qualify for a limited access permit. There is a possibility that if some of the trawl or scallop vessels do not qualify for monkfish permits, they may change gears and target herring.

## **6.8 Spiny Dogfish**

The fishery for dogfish began to expand dramatically in 1990, with landings increasing to 27,000 mt in 1996 before declining to 20,500 mt in 1997. The primary gear types in this fishery are trawls and gillnets. Landings occur in every state from Maine to North Carolina, with Massachusetts and North Carolina recording the highest landings for the period 1988-1997 (MAFMC 1998b). In 1996, gillnets accounted for more than 80% of the dogfish landings.

The Mid-Atlantic Fishery Management Council and the Council are developing a joint fishery management plan for dogfish. Because dogfish are overfished, the proposed plan recommends a

one year "exit" fishery with landings of 10,000 mt, followed by a nine year rebuilding schedule that estimates allowable landings of approximately 3,000 mt per year, increasing gradually towards the end of the time series to about 3,700 mt. The allowable landings may be divided into different time periods. Because of the requirement to have a low level of landings to meet the mortality goals of the plan, a major consideration is the impact of discards. The proposed FMP estimates discards from bottom trawl and gillnet gear for the 1989-1997 time period, using the domestic sea sampling program database. The FMP includes estimates of discards in these gears based on target species. For Atlantic herring bottom trawls, the FMP estimates annual discards occurred at a rate of 0.0235, resulting in discards ranging from a low of 25,200 pounds in 1989 to a high of 211,000 pounds in 1992 (MAFMCb, 1998).

As described in section E.6.4.2.6, observer trips in the fall of 1997 noted discards of dogfish in both the mid-water trawl and purse seine herring fisheries. The highest proportion was in the purse seine fishery, with catches of 75,050 pounds of dogfish in a small number of sets in one particular area. The observed discards from limited observer data are higher than the estimated discards for directed herring bottom trawls for three of the nine years summarized in the spiny dogfish FMP. The limited number of observed trips, as well as the highly localized nature of the large dogfish catches, makes it impossible to draw conclusions on the overall discards of dogfish in the herring fishery. In addition, as noted in section E.6.4.2.6, there is no estimate on dogfish discard mortality in the herring purse seine fishery.

## **6.9 Conclusions**

The herring fishery is one of the few remaining open access fisheries in the New England and mid-Atlantic areas. The resource is also in an underutilized condition, though there is concern the Gulf of Maine spawning component may be fully utilized. This fishery has the ability to absorb some additional fishing effort and provide additional revenues to the region. This capacity is not unlimited and will need to be closely monitored. If a significant number of vessels enter the fishery, it may lead to development of a "part-time" fishery as the increased fishing effort results in the TAC being reached early in the season. While new entrants using herring as a supplement to other fisheries may benefit from this arrangement, some of the traditional herring boats do not have permits that would allow them to enter another limited entry fishery. Any shifts of fishing effort onto herring will depend, in large measure, on the ability to enter into existing markets and develop additional demand.

Vessels that rely on the fishery for most of their revenue are likely to continue to do so. In particular, the 20 vessels (as identified in the VTR database), that currently land most of the herring are not likely to shift into other fisheries. The area TAC system will shift some of the effort of these vessels out of the inshore Gulf of Maine area into other areas, particularly Management Area 1B and, in the summer, Area 3. This change will benefit the resource as it will reduce pressure on the inshore Gulf of Maine spawning component. This shift will not be without cost. These areas have only been fished in limited manner by current participants and will require lengthier trips to locate and catch herring. New vessels may also choose to enter the fishery – in fact, two new participants entered the fishery in the fall of 1998. One vessel was converted from another fishery, while the second was new construction.

There may also be some shifts in effort from other fisheries into the herring fishery in response to increasing regulation in those fisheries. The primary methods for herring fishing are purse seines and mid-water trawling. Those vessels in other fisheries that use dredge or trawl gear can enter the fishery in one of two ways. Scallop vessels, in particular, may seek ways to enter the herring fishery in order to supplement revenues reduced by a stringent days-at-sea reduction program. One way to enter the herring fishery is to convert a vessel to one of the two primary herring gears. The most likely conversion is for a bottom trawl or scallop vessel is to convert to a mid-water trawl net. This conversion can cost in the range of \$100,000 - \$150,000.

An additional difficulty faced by those choosing to convert to this fishery is the rapid decomposition of herring after it is caught. This requires either short trips or a system to chill or preserve the herring at-sea. Two typical processes are a refrigerated sea water (RSW) system or freezing. The addition of RSW systems, considered necessary to bring in a food quality product from offshore, can raise the total costs to over \$200,000. This high cost will serve to limit the number of vessels that choose to enter the herring fishery through conversion. Another possible impact is that those vessels that choose to convert and enter the fishery may forego expensive cooling systems and fish close to shore. This could result in rapid landing of the TAC in Management Area 1A, for example, and the slow development of a fishery that targets the offshore resource.

One possible way to avoid the RSW conversion costs and develop the offshore resource is for vessels to use processing capacity on another vessel. In the past, this was accomplished in other fisheries through joint venture activities with foreign processing vessels. This option is available in the herring fishery if foreign partners can be found, subject to the JVP specification, but there has been limited participation in the herring fishery by JVs in recent years (section E.6.4.2.2). In addition, the FMP may provide an opportunity for a similar activity with U.S. processors, limited to the USAP specification. While the recommended specification for USAP for the first year of the plan is 0 mt, there may be an opportunity for this activity in the future.

A lower cost option for some vessels will be to use a small mesh net authorized under the proposed whiting regulations to target herring. This would avoid the costs of conversion to a mid-water trawl configuration. In the Gulf of Maine and Georges Bank area, these vessels would be limited to fishing in certain specific areas and time periods. These vessels are not restricted in the amount of herring that they can land, as long as whiting possession limits appropriate for their permit category are not exceeded. In 1998 there was also an experimental small mesh fishery, using a grate, that targets whiting. These vessels were limited to fishing within the Gulf of Maine/Georges Bank Small Mesh Northern Shrimp Fishery Exemption Area during the period June 15 – November 30. Thirty-two vessels participated in this fishery in 1997, but this experimental fishery has not yet been approved for 1999. Approximately 31 vessels have participated in a whiting experimental raised footrope trawl fishery during the autumn throughout portions of the Gulf of Maine. Although this experimental fishery has not yet been approved for 1999, raised footrope trawls are currently required in both Small Mesh Area 1 and Small Mesh Area 2 to fish for any species. Small mesh bottom trawls in use throughout these areas are therefore raised footrope trawls and are already capable of catching not only whiting, but also herring and several other small mesh species. The use of small-mesh bottom trawls allowed in the whiting fishery provides a relatively low cost way to enter the herring fishery. The permit

moratorium proposed for the whiting fishery, however, will limit the number of vessels that can use this option to enter the herring fishery on a seasonal basis.

Another category of vessels that are more likely to enter the herring fishery are the freezer trawlers that participate in the squid, mackerel, and butterfish fishery. In 1998, the *illex* squid quota was caught by September. As a result, some of these vessels began fishing for herring to extend their seasons. This option will still be available under the proposed herring management plan, and these vessels can be expected to take advantage of this fishery if the *illex* fishery closes early in the future. A late-summer or early-fall herring fishery could serve as a "bridge" between an *illex* season that closes early and the winter mackerel fishery. Mackerel vessel fishing in the winter will continue to occasionally catch herring. There may be increased reporting of these landings as these vessels establish a history of fishing for herring in anticipation of any future limited entry or controlled access programs that may be considered.

All of these other fisheries are for species higher in value than herring. It is unlikely that vessels will exit these fisheries unless there is a complete closure. Rather, they will use the herring fishery as a supplement to primary fishery caused by increasing regulations and poor resource conditions. Some current participants in the whiting and monkfish fisheries that do not qualify for a limited access permit may shift to herring, but most of these vessels possess permits for more valuable fisheries, so this is not likely to be a widespread practice. In the squid and mackerel fisheries, the timing of the normal fishing seasons may make the herring fishery an attractive way to extend their seasons. Mackerel is primarily caught in the January through March time frame. Most *loligo* landings occur in the winter or autumn (January through April and October through December), while most *illex* landings are taken during the June through October time frame (MAFMC 1998a). This pattern may fit in well with a shift into the herring fishery in the late summer/early autumn, particularly in those years when the *illex* quota is taken in the late summer. As noted above, many of the boats in this fishery are able to freeze their catches at sea. This ability will make them well-suited to target the herring resource on Georges Bank and Nantucket Shoals if the Area 1A herring TAC is reached.

The strict landings quotas proposed for the dogfish fishery will reduce that fishery to incidental catches only. Because most dogfish are landed by gillnet vessels, there is unlikely to be a major shift in effort by these vessels into the herring fishery, as they probably lack the size, power, and equipment necessary to target herring. It is possible, however, that trawl vessels that target dogfish may continue their search for an alternative to groundfish and may enter the herring fishery. A more likely interaction between the dogfish and herring fisheries may be the result of dogfish bycatch in the herring fishery. If the dogfish plan does not meet its mortality targets because of discards in other fisheries, there may be a necessity to implement measures to reduce the bycatch of dogfish in the herring fishery. Whether such action is necessary will be difficult to determine without additional information on dogfish discards and, in particular, dogfish mortality in the seine and mid-water trawl herring fisheries. If the limited observer information from 1997 accurately depicts the localized nature of dogfish bycatch, the proposed first-year TAC for Management Area 1A may reduce dogfish bycatch by reducing the fishing effort in this area in the fall.

One impact difficult to predict is how fishing effort will shift in response to development of a roe

fishery. The plan does not initially impose any limitations on the harvest of herring for roe, other than the overall TACs and the restrictions on dumping of the carcasses, though a harvest limit may be imposed in the future. If a market can be identified, the higher value of roe may encourage investment in costly mid-water gear. This could also provide an opportunity for smaller vessels to enter the fishery, since the higher price received for roe means large volumes will not be as critical to success.

One factor that will be critical to the developing herring fishery will be the impact of management measures in the lobster fishery on the demand for bait. These two industries are closely linked because each depends on the other. If the proposed trap reductions and other measures significantly reduce bait demand, it will be critical for herring fishermen to develop alternative markets in order to fully utilize the resource. A reduction in demand from the lobster industry, coupled with a failure to develop new markets, could slow development of the fishery, make it more difficult for vessels to enter the herring fishery, and actually reduce herring landings. In a similar fashion, however, the collapse of the lobster fishery due to overfishing would have more immediate impacts. The TAC distribution scheme adopted by the herring plan may result in local shortages of herring until the industry exploits the offshore resource and redistributes its effort.

An expanding herring fishery could also lead to increased conflicts with fixed gear fishermen. In particular, if the number of mid-water trawl vessels increases, there may be additional conflicts with lobster fishermen. Contributing to the possibility of additional conflicts are the increased restrictions on small groundfish vessels in the Gulf of Maine. Many of these small vessels will be unable to fish for groundfish due to additional seasonal closures. While a considerable investment in gear is required, some of these boats may fish for lobster as an alternative. Many lobster fishermen locate their gear in groundfish closed areas, taking advantage of the lack of mobile gear fishing to minimize gear losses. Herring vessels, however, are allowed into groundfish closed areas. The most likely areas for conflicts will be the Gulf of Maine and Georges Bank, where the summer/fall herring season coincides with heavy lobster fishing activity. While there is a possibility that an increase in effort during the winter fishery may result in increased conflicts in southern New England, this is less likely since the lobster fishery moves offshore and in recent years most winter herring fishery has been inshore. An increase in the number of herring vessels could result in additional gear conflicts, particularly in these areas. The large volumes of herring landed by full-time herring fishermen, however, means that the total number of boats in the fishery will likely be relatively small compared to the number of vessels in other fisheries. In addition, the requirement that vessels that catch most of the herring be equipped with VMS will make it easier, if necessary, to adopt and enforce areas to reduce gear conflicts.