2.0 HISTORY AND DESCRIPTION OF ISSUES

2.1 Background

Initial concerns

Recent U.S. landings of monkfish have increased dramatically in response to an increase in the market value of the species in combination with the decline in abundance of traditional target species. Most monkfish are taken as incidental catch (aka bycatch) in the Northwest Atlantic groundfish and scallop fisheries, although directed effort is increasing. Directed effort is occurring in both deepwater (100-150 fathoms) by otter trawls and in shoal waters by gillnets and scallop dredges.

When the Councils were first considering potential management steps for monkfish, landings of monkfish tails had increased markedly since the mid-1980s when they averaged 2.5 mt (5.5 million pounds, Figure 2). In 1992, the landings of tails increased to a record high 4.6 mt (10.3 million pounds, Figure 2). These high levels occurred because of increasing directed fishing effort and increasing fishing effort for groundfish and scallops which occurred throughout the mid- to late-1980's. Most landings (80%) come from bycatch in the groundfish and scallop fisheries. During the early phases of developing a management plan, increases in monkfish fishing effort pushed the directed catch to nearly 30% of total monkfish landings. This increase in directed effort has been observed in the 1990 data from both trawl and scallop dredges. The geographical range of directed effort by fishermen using these two gear types was different (Figure 1), but generally occurred in deeper waters. Directed fishing activity continued during the 1991-92 fishing season, abated during 1992 when prices fell, but then expanded as price increases resumed. Directed fishing with gillnets had also become more prevalent. Interest in fishing for monkfish was fueled by the valuable liver market (709,000 pounds at $3.66 in 1992, Table 2) and increasing market acceptance of small monkfish tails. This trend was expected to continue, especially from fishermen seeking alternatives to the traditional scallop and groundfish fisheries that would be subject to new fishing regulations.

Industry request for management action

Fishermen and fish dealers related their concerns about the monkfish fishery to both the New England and Mid-Atlantic Fishery Management Councils during 1991 and early 1992. They cited the increasing amount of "small" and "peewee" category tails being landed, the more frequent gear conflicts between monkfish boats and other fishermen, and the expanding directed trawl fishery as problems.

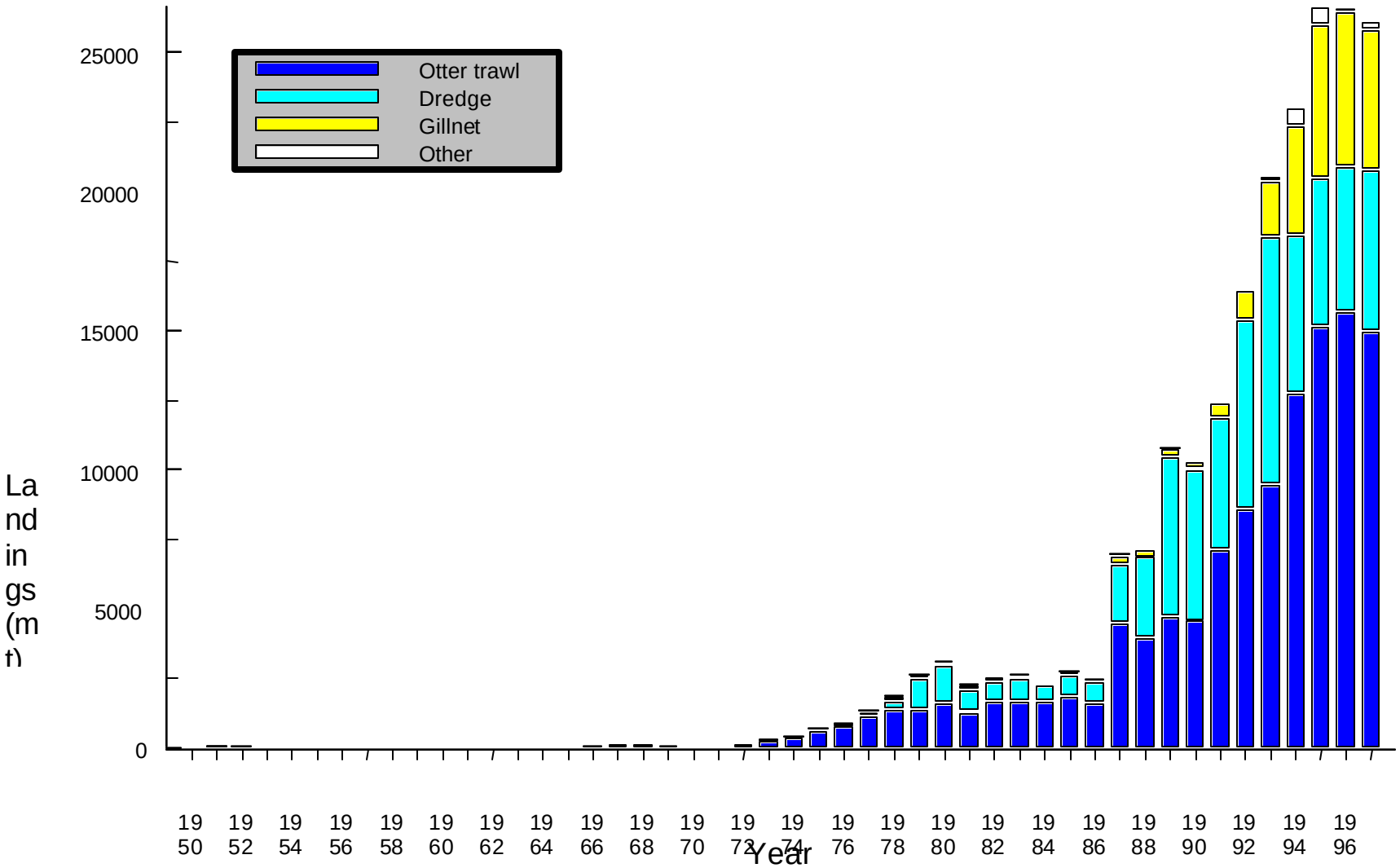

Figure 1. Monkfish landings (live weight) by major gear type, 1950-1997. Source: NMFS - http://remora.ssp.nmfs.gov/commercial/landings/index.html as of April 27, 1998.

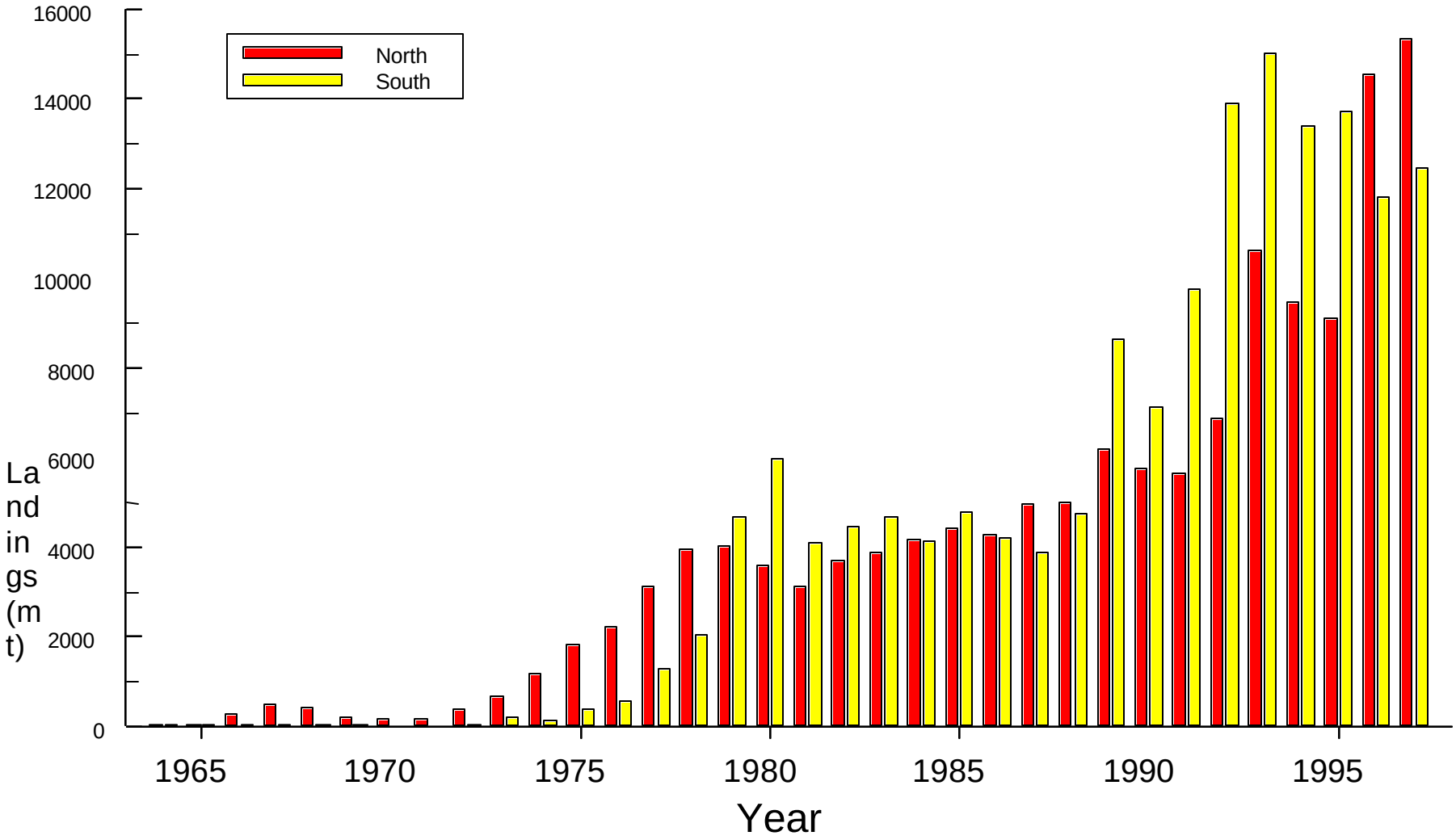

Figure 2. Monkfish landings by proposed management areas. Landings for 1997 are apportioned by the ratio of landings in 1996. Source: NEFSC 1997 for 1964 to 1995; landings from dealer data in 1996 was apportioned by reported landings by area fished from vessel trip reports.

Table 1 Monkfish landings and revenue, 1964 to 1997. Source: NMFS weighout and dealer data.

Year	Total live weight (million lbs.)	Total live weight (mt)	Total ex-vessel revenue (million $)	Price per pound (live weight)	Price per pound (tail weight)
1964	0.1	0.0	0.0	$0.01	$0.03
1965	0.1	0.0	0.0	$0.01	$0.03
1966	0.7	0.3	0.0	$0.02	$0.07
1967	1.2	0.5	0.0	$0.02	$0.08
1968	1.0	0.5	0.0	$0.02	$0.07
1969	0.6	0.3	0.0	$0.02	$0.06
1970	0.5	0.2	0.0	$0.02	$0.05
1971	0.5	0.2	0.0	$0.02	$0.06
1972	1.0	0.5	0.0	$0.02	$0.06
1973	1.9	0.9	0.1	$0.03	$0.11
1974	2.9	1.3	0.1	$0.04	$0.13
1975	4.7	2.1	0.3	$0.06	$0.20
1976	5.9	2.7	0.6	$0.10	$0.32
1977	8.8	4.0	1.0	$0.11	$0.36
1978	11.5	5.2	1.2	$0.10	$0.34
1979	16.3	7.4	2.0	$0.12	$0.40
1980	16.9	7.7	2.6	$0.16	$0.52
1981	12.2	5.5	2.2	$0.18	$0.60
1982	16.6	7.5	2.8	$0.17	$0.56
1983	17.6	8.0	2.8	$0.16	$0.53
1984	17.4	7.9	3.1	$0.18	$0.60
1985	19.3	8.8	4.3	$0.22	$0.73
1986	18.4	8.3	6.8	$0.37	$1.24
1987	19.2	8.7	9.6	$0.50	$1.67
1988	21.1	9.6	10.1	$0.48	$1.60
1989	32.4	14.7	12.8	$0.39	$1.31
1990	28.6	13.0	13.2	$0.46	$1.53
1991	34.2	15.5	21.8	$0.64	$2.11
1992	46.0	20.9	20.7	$0.45	$1.50
1993	56.7	25.7	21.7	$0.38	$1.27
1994	50.6	23.0	26.1	$0.52	$1.71
1995	58.8	26.7	36.5	$0.62	$2.06
1996	58.5	26.5	32.3	$0.55	$1.83
1997	57.5	26.1	NA	NA	NA

Table 2. Landings of monkfish livers, 1982 to 1997. Source: NMFS weighout and dealer data.

Year	Liver weight (million pounds)	Liver revenue (millions $)	Liver price per pound
1982	0.022	0.0	$1.00
1983	0.026	0.0	$0.88
1984	0.055	0.1	$1.15
1985	0.062	0.1	$1.11
1986	0.08	0.1	$1.65
1987	0.119	0.3	$2.63
1988	0.249	0.8	$3.37
1989	0.323	1.2	$3.77
1990	0.396	1.6	$4.03
1991	0.598	2.5	$4.16
1992	0.709	2.6	$3.66
1993	1.014	3.9	$3.80
1993	1.014	3.9	$3.80
1994	1.006	5.2	$5.20
1995	1.102	5.5	$5.00
1996			
1997			

Early Council efforts

During 1991, both the Mid-Atlantic and New England Councils requested approval from the Regional Administrator to develop a management plan for monkfish. The Regional Administrator suggested that the Councils convene a joint committee to evaluate prospects for managing this fishery. That committee found that there were sufficient reasons for concern and that the Councils should jointly develop a management plan for monkfish. Those reasons included the recent declines in survey indices, the declining size of tails being landed, the potential for shifts in effort due to management restrictions on other species, evidence of an expanding directed fishery, and a rapidly growing market for monkfish tails and livers.

The Councils gave the joint monkfish oversight committee two charges: a) to work with the fishing industry to facilitate a resolution to the problematic gear conflict in Southern New England and b) to initiate the development of management measures for monkfish.

During 1992 and 1993, the Councils took steps to resolve the offshore gear conflicts between trawlers, many fishing for monkfish, and fixed gear fishermen, e.g. lobstermen. Several meetings with industry advisors led to a gear conflict resolution, in the form of a written voluntary agreement by fishermen in the offshore waters. This resolution had provisions for communicating at sea, returning gear that was inadvertently damaged, and setting aside areas for certain fishing gear on a seasonal schedule. After this agreement was developed, the gear conflict issue was transferred to a different Council oversight committee, so the monkfish committee could focus on developing management measures.

Scoping hearings

While they worked on the gear conflict issue, the Councils also discussed the various problems and proposed various potential management responses. These problems and options were presented at scoping hearings

on February 11, 1993 in Warwick, RI and on March 2, 1992 in Philadelphia, PA. During these hearings, it was obvious that many management measures were unworkable because of insufficient data to define the proper limits or because the industry felt that they would be ineffective. There was, however, wide industry support for a minimum size to protect the resource and to improve the monkfish markets.

A number of fishermen also supported a limit to prevent fishermen from cutting livers from undersized fish. They indicated that conditions often varied, but a 20 to 30 percent limit compared to tail landings by weight was acceptable. These comments were considered by the Councils, and although the supported options would not fully protect the resource it was recognized that they would form a significant first step to management until other options were developed.

State management actions

Many fishermen urged the Councils to quickly develop and implement simple management regulations to protect the resource. A minimum size limit was overwhelmingly supported during the initial scoping hearings. After discussing the options, the Councils decided that the states could implement landings regulations much quicker than the Councils could develop a fishery management plan and have an FMP approved by the Secretary of Commerce.

Because of the concern over rapid deterioration of the resource while these small fish were being caught, the Councils desired to implement some conservation measure using the most expedient procedure. Because of the lengthy FMP process and the reluctance of NMFS to promulgate emergency regulations for species which do not have governing FMPs, the Councils requested coastal states from North Carolina through Maine to implement landings and/or possession limits for monkfish that will dovetail with the management measures under development. This effort was seen as the most expedient way to improve conservation of monkfish while the more lengthy FMP development process was underway. To date, NJ, NY, CT, RI, MA, and NH have implemented an 11-inches minimum tail length (17 inches minimum whole fish length), and a 25 percent liver to tail landings ratio per trip restriction.

Draft Fishery Management Plan

Although the Council met twice since scoping hearings to discuss and refine the management goals, strategy, and proposed measures, progress in developing this preliminary Monkfish FMP was hampered by Council progress on major amendments to the Multispecies, Atlantic Sea Scallop, and American Lobster FMPs. Nonetheless, a draft Monkfish FMP was developed by the joint monkfish oversight committee based on industry support for simple, effective management measures. The Council staff developed a draft document containing preferred and non-preferred alternatives and submitted it to the oversight committee on August 4, 1994.

The committee and advisors reviewed portions of the initial draft FMP, especially the objectives, the overfishing definition, the management measures, and their relation to measures recently implemented by the states. The committee determined that the goals needed a wider scope to address potential effort shifts from groundfish, scallops, and summer flounder. It was suggested that this effort shift might be alleviated and mortality reductions accruing from groundfish and scallop management could be justified if additional limits were added to the multispecies and scallop plans. These limits would prohibit vessels from using groundfish and scallop gear to fish for monkfish on traditional groundfish and scallop grounds unless they were fishing under the days-at-sea program.

The committee was also informed that, given the provisional definition of overfishing, that monkfish may be overfished. The committee determined that the proposed management measures may need to be revised if monkfish are overfished and that a planned review of the overfishing definition by the Groundfish PDT would provide guidance to the committee.

The Groundfish PDT reviewed the proposed overfishing definition for monkfish on September 13, 1994, but was unable make a specific recommendation at that time. While the PDT thought the proposed definition was viable, re-analysis under different assumptions and additional data was needed.

The PDT did, however, conclude that the management measures in the draft FMP were insufficient to prevent overfishing, even in the short-term. It concluded that a management plan that was not expected to prevent overfishing would violate National Standard 1 and it would not, therefore, receive favorable review.

Comprehensive plan/amendment

The joint monkfish oversight committee met on September 26, 1994 and discussed the PDT's conclusion. It decided that a more comprehensive strategy was needed to manage monkfish and prevent overfishing.

To lay the groundwork for this expanded management program, the committee added an additional goal: to maximize the economic benefits to various fishery sectors. It also identified three FMP strategies that would apply under various resource conditions. When the monkfish resource was near full exploitation, increases in fishing mortality from directed fishing effort would be allowed to replace the observed reductions in fishing mortality caused by existing restrictions on the by-catch or mixed-trawl fisheries (scallops, groundfish, and summer flounder). Capping current directed fishing effort and achieving reductions in mortality through existing regulations on fisheries where monkfish was a by-catch would apply when the monkfish resource became overfished. If the resource was greatly overfished, the management strategy would be to reduce fishing mortality through reductions in the directed monkfish fishery.

Based on the above technical advice from the Groundfish PDT, the committee reviewed the full range of management measures that might apply to the monkfish fishery. A wide variety of management measures, either operating in isolation or combined with other measures was discussed (Section 6.2). The committee identified two preferred alternatives and directed the Council staff to analyze these measures for review. Both of these alternatives included the management measures that formed the preferred alternative in the previous draft FMP.

One preferred alternative that was identified had the following characteristics: a combined quota for by-catch or mixed trawl/dredge/gillnet fisheries and limited access to the directed fishery for monkfish. The by-catch or mixed species fisheries would also be controlled by a trip limit under the Monkfish FMP. All monkfish landings by vessels having a permit to participate in the directed fishery would be counted against the quota.

A second preferred alternative for the draft FMP and public hearing document was also identified as having a limited access program for the directed fishery and a directed fishery quota. All monkfish landings by vessels whose revenue derived from monkfish (tail and liver) landings exceeded a certain percentage of the total trip's value would be counted against the directed fishery quota, regardless of whether a vessel had a permit to participate in the directed fishery for monkfish. A trip limit would not apply to any fishery, however, until after the directed fishery quota was reached. Once that occurred, a trip limit would apply to all vessels fishing for other species.

Trip limit alternatives

One of the early difficulties with the committee's proposal was how to segregate and manage fisheries that depended on monkfish as a targeted catch versus fisheries that had a monkfish bycatch. Although it was attractive to determine who was targeting monkfish by the proportion of total revenue from monkfish landings, the Councils recognized the problems with managing the fisheries on this basis. The obvious conclusion was to examine the landings of the various fisheries and define them by the amount of monkfish landed per unit of effort (trips or days-at-sea).

The Councils examined the landings of monkfish by gear, area, and permit category to derive proposed trip limits for fisheries with monkfish bycatch. The purpose of these proposals was to discourage targeting of monkfish by vessels that relied on other species, and control the number of vessels and their monkfish catch in a directed fishery. Reductions in bycatch mortality would later be achieved in these fisheries through regulations intended to achieve effort and mortality reductions for groundfish, sea scallops, and summer flounder. The Councils also wanted to prevent extensive discarding resulting from abnormally low trip limits.

Public meetings

Specific trip limits were proposed at the following three public meetings to seek industry comments on whether the trip limits would be sufficient to allow fishermen to land customary bycatches of monkfish, while discouraging targeting monkfish under a trip limit:

July 19, 1995 in Fall River, MA
July 25, 1995 in Longbranch, NJ
August 3, 1995 in Portsmouth, NH

Although there were some controversial issues raised (scallop dredge trip limits and mixed fishery trip limits), many fishermen and industry representatives believed the proposed trip limits were appropriate for monkfish landed as a bycatch. There was considerable disagreement, however, about when monkfish were targeted within a trip or when they were targeted as part of a catch of mixed species.

Restructuring Federal fishing regulations: Effect on monkfish management

NMFS announced its intentions to streamline and condense Federal regulations governing fisheries during the late summer of 1995. These efforts were to reduce the number of Parts within 50 CFR by combining regulations for the fisheries in the Northeast region of the U.S. Some fishery management plans would be withdrawn from Federal management authority and additional species to be managed would, in the future, be included within existing FMPs.

At the September 1995 Council meeting, the Northeast Regional Administrator told the New England Council that management measures for monkfish should be appended to an existing plan. Although the RA thought that there would be benefits from using existing management measures, he advised that separate management measures would be acceptable to address issues unique to the monkfish fisheries.

Subsequently the Council concluded that it would be more appropriate to append monkfish management measures to the Multispecies FMP via an amendment to the plan. The new initiative, however, re-focused the Councils' attention on the relationship between monkfish management and the management of other, related fisheries. As a result, the alternatives that the Councils now propose include specific provisions to incorporate and benefit from existing regulations where monkfish is caught by presently regulated fishing vessels.

Submission of a monkfish overfishing definition

When the groundfish plan development team made its recommendations, technical evaluations of various biological reference points were underway. Although an overfishing definition, based on these potential reference points, had not been recommended to the Council, it was clear that any reasonable benchmark would conclude that monkfish mortality was too high and that biomass was extremely low.

The Councils and the Northeast Fishery Science Center (NEFSC) continued to evaluate potential reference points through a more formal arrangement by forming a Technical Working Group (TWG). This sub-committee, composed of staff-members from the NEFSC, the NEFMC, and the MAFMC, was charged with recommending an overfishing definition to the Council and suitable TACs to prevent overfishing.

The TWG initially met on September 24, 1995 and examined historic data from the research survey and commercial landings to recommend a maximum mortality level and a minimum stock biomass for two monkfish management areas. It formally recommended an overfishing definition, based on the analyses it conducted, to the Councils on February 14, 1996.

The Councils raised several issues about the basis for the recommendation and asked the TWG to re-examine the issues raised. Additional TWG meetings were held and a revised recommendation was proposed to the Councils on May 2, 1996. Following a slight adjustment to the target reference points, the Councils submitted the overfishing definition on July 1, 1996 to the Regional Administrator for certification.

Management alternatives and public hearings

The Councils further refined the proposed amendment to the Multispecies FMP. Three alternatives are now included, each affects the various fisheries in different ways. They are explained in more detail in Section 5.0. The Council has scheduled a series of public hearings from North Carolina to Maine and seeks your comments on these alternatives and the management options within them.

Issues identified at public hearings

The public commented on the following issues when the Council proposed alternative 3 as a preferred alternative in January 1997. The page, table, and figure references in the following discussion of issues are for the February 1997 Public Hearing Document, the Draft Amendment 9, and in the Draft Environmental Impact Statement. The major issues were:

1. **Should the range of the management unit coincide with the range of the monkfish stock(s) in US jurisdiction?** The public hearing document describes the management unit extending from the US-Canada boundary to the NC-VA border and from the shoreline to the 200-mile limit (page 3). The staff erroneously added this specific description of the management unit during the final editing stages. Previous drafts described the Southern Fishery Management Area as extending to the south and west of the line separating it from the Northern Fishery Management Area. The section on the ?Scientific Basis for Management? (page 27) describes the management unit as extending from ?Cape Hatteras, NC to the US - Canadian boundary, seaward to the 200 mile limit.? Chang (1990) furthermore shows that the distribution of goosefish (commonly known as monkfish) is continuous to Cape Hatteras, NC. The analyses that support the draft amendment include fishery and biological data from statistical areas 635 and 636, although NC landings do not appear in the NMFS weighout data base.

2. **Should the Council adjust the TALs to be consistent with the latest stock assessment?** The TALs would act as a guideline to determine whether alternative 3 is meeting its interim biological objectives. According to the schedule in Table 3 (page 15), the TAL would be 3,000 mt and 6,000 mt for the fishing year beginning July 1, 1997 for the northern and southern fishery management areas, respectively. The fishing mortality rate is expected to be 0.07 and 0.26 if the landings do not exceed these levels.

   In the northern area, landings during the assessment period increased from 6,505 mt in 1989-93 to 9,124 mt in 1991-95. Fishing mortality decreased slightly from 0.17 to 0.15. The reference point stayed at 0.05, implying a higher TAL at the reference point, from 2,148 mt to 3,041 mt. Since the current schedule calls for a TAL of 3,000 mt, it suggests that the reference point would be achieved in the first year of implementation. Based on these latest figures, the amendment could allow for landings of 4,258 mt, equivalent to the original interim target fishing mortality rate, 0.07.

   The assessment results for the southern area also suggest that the initial TAL could be increased and achieve the originally intended mortality rate. Landings during the assessment period increased by 25 percent, while mortality only increased by 13 percent. Unlike the northern area, however, the overfishing threshold declined from 0.22 to 0.14 due to adjustments in the measure of relative abundance during 1970-79. This change implies a lower TAL for the southern area, declining from 4,927 mt as estimated by the Technical Work Group to 3,612 mt based on the recent assessment. The first-year TAL, however, could be increased from 6,000 mt to 6,708 mt, equivalent to the original interim target fishing mortality rate, 0.26.

Area	Time period	Original TAL	Expected F	Expected F, SAW 23	Revised F	TAL @ revised F	Percent change
North	1991-95	6,505	0.17	0.15	0.15	9,124	
	1997-98	3,000	0.07	0.05	0.07	4,258	-53.3%

Area	Time period	Original TAL	Expected F	Expected F, SAW 23	Revised F	TAL @ revised F	Percent change
	Overfishing threshold	2,148	0.05	0.05	0.05	3,041	-66.7%
South	1991-95	10,488	0.45	0.51	0.51	13,157	
	1997-98	6,000	0.26	0.23	0.26	6,708	-49.0%
	Overfishing threshold	4,927	0.22	0.14	0.14	3,612	-72.5%

3. **Is the rebuilding schedule (page 2) consistent with the amendment agenda?** The amendment calls for a stepped reduction in the TAL guidelines to not exceed the overfishing threshold by year seven. The rebuilding schedule is currently eight years, or two times the time it takes female monkfish to reach maturity. At face value, long-term increases in stock biomass cannot occur until the exploitation rate is less than the overfishing threshold. The Council does not expect to reach this goal until year seven. Rebuilding to the biomass target (B_{target}) cannot occur in only one year.

   The Magnuson Act requires the Councils to ?specify a time period for ending overfishing and rebuilding the fishery? (Section 304(e)). It also mandates that this time period be as short as possible, but no longer than 10 years.

   Resolution of this issue is necessary to prepare the net benefit analysis, comparing the proposed action to No Action. Delaying this decision will significantly impact our progress to finalize the amendment documents.

4. **Should the reference points for the northern and southern management areas be adjusted?** It is difficult for many to understand why the overfishing thresholds are so disparate in the northern and southern fishery management areas. Until the most recent assessment, the overfishing definition required a 67 percent reduction in catch in the northern area, but only a 50 percent reduction of catch in the southern area.

5. **Are the objectives consistent with the National Standards, especially with those added by the Sustainable Fisheries Act?** Several people have commented that the monkfish proposals will increase bycatch in an attempt to achieve plan objective 4 (page 2), violating the intent of National Standard 9. They also argue that objective 4 makes it difficult to address objectives 1 to 3 and achieve rebuilding. There is also confusion over what the Council means by ?incidental catch? in objective 4 and ?bycatch? in National Standard 9. Many use ?incidental catch? and ?bycatch? interchangeably.

6. **Which alternative most closely resembles the one favored by the public comments?** When the public spoke favorably about one alternative over another, most supported alternative 3.

7. **Which qualification criteria should be used to limit eligibility for monkfish-only days-at-sea.** Public comment on this issue was relatively light. Many assumed that the Councils would select option 3 to qualify vessels. Unless they started to target monkfish after the control date, fishermen thought they would qualify under this option. Small vessels that target monkfish and seldom land more than 750 pounds are discussed in item 8.

8. **Should the Council adjust the limited access qualification criteria for small vessels that target monkfish?** The current proposal will exclude some small vessels that rely on monkfish. These vessels generally take short trips and land small volumes of monkfish on each trip. If the fish hold capacity is less than 750 pounds, they would never accumulate enough trips to qualify under option 3a (page 13). The

other qualification issue is that some vessels entered the monkfish fishery, unaware of the control date and their low probability of access after monkfish regulations are implemented. They claim that they were not notified of this possibility because they held no federal fishery permits (the official method of notification).

9. **Should there be limits on how multispecies vessels can use their days-at-sea to target monkfish?** People in the Mid-Atlantic region expressed concern that multispecies vessels could target monkfish with their unused days-at-sea, while other vessels that rely on monkfish would be denied access due to the control date and qualification criteria. Some stated that they would like the Councils to prevent multispecies trawl vessels from using gillnets to target monkfish.

10. **Should there be a size limit to protect juvenile monkfish and should the minimum size be 14" tail length?** About 75 percent of female monkfish are sexually mature when they yield a 14-inch tail. At a size that yields a 12-inch tail, 50 percent of females are mature in the northern area and slightly less than 75 percent of females are mature in the southern area (page 27). Two of the objectives are to maintain a healthy spawning stock and prevent increased fishing on immature fish. The most effective way of meeting these objectives is to reduce the catch of small, immature monkfish. The question is whether a size limit is an effective tool for achieving the objectives.

    Fishermen stated during scoping hearings that they would be able to avoid concentrations of small monkfish, but that these areas were not persistent from year to year. Many supported a minimum size to keep fishermen from targeting small monkfish that could not be landed because of the size limit and the Councils had broad support for a 12-inch size limit. Fishermen from Maine initially supported an 11-inch size limit and then later supported no size limit.

    During public hearings, some fishermen favored the 14-inch or larger size limit. Others feel that the size limit is wasteful, creating regulatory discarding in violation of National Standard 9. The amounts of discard could be substantial (Section 11.6.6 in the DSEIS, pages 132 to 141), if fishermen do not change fishing behavior in response to the size limit. This response cannot be quantified, however. The more that monkfish contribute to bycatch, rather than a main component of the catch, the less likely it is that fishermen will change fishing behavior in response to the size limit. Fishermen that target monkfish are the more likely to avoid concentrations of small fish, but can do so more easily when small fish are abundant.

    Based on the estimated growth parameters and natural mortality, positive benefits are expected if discard mortality is less than 40 percent (Figure 35, page 134). The maximum marginal benefit at the highest discard mortality rate occur with a 17-inch tail size limit.

    Other comments pointed out that more monkfish could be targeted and landed due to highgrading imposed by the size limit. They also pointed out that the fishery would generate higher fishing mortality rates if it landed the TAL amounts.

11. **Should the liver to tail ratio be adjusted to more vigorously prevent highgrading?** The Councils proposed a 25 percent liver to tail ratio and a 10 percent liver to whole fish ratio, consistent with most state landings regulations. NJ adopted a 30 percent liver to tail ratio based on sampling that showed seasonal variation in monkfish liver yield that exceeded the 25 percent ratio. For all areas and seasons, the mean liver to tail ratio is about 18 percent and the mean liver to whole fish ratio is about 8 percent.

    The rationale for the 10 percent and the 25 percent limits is explained in Section 11.6.9 of the DSEIS (page 154). It is the same rational that the Councils offered to the states for these limits. Under average conditions, fishermen would have opportunities to retain livers from undersized monkfish and discard dead monkfish. If they land whole fish, fishermen could increase their liver landings from the 8 percent average to the 10 percent limit. If they land monkfish tails, fishermen could increase their liver landings from the 18 percent average to the 25 percent limit.

    On the other hand, seasonal and geographic variations in monkfish yield may cause situations when fishermen would be forced to discard livers in order to retain their monkfish catch. This problem becomes

more frequent as the limit on the percentage of liver landings is reduced. If the limits are set at average levels, it would cause fishermen to discard valuable livers in order to retain monkfish on half of their fishing trips.

Some public comment suggested that the ratio should be based on a one-to-one count. It makes intuitive sense, but others have claimed that monitoring and enforcement would be difficult and burdensome. Livers are often bagged at sea and may break into large pieces during processing.

12. **Are there uninvestigated ways to limit or reduce the bycatch of small monkfish?** Many people commnted that landings restrictions (minimum size and trip limits) will not limit or reduce mortality on monkfish. These comments gave little credence to the limited access and effort restrictions as primary management measures to reduce mortality and instead focused on these landings limits. The intent of these limits was to prevent increased targeting of monkfish when they are normally an incidental catch and to prevent increased targeting on small monkfish.

    On the other hand, the comments suggested that the Councils had not done enough to identify ways to reduce mortality with less size-selective gears. Some comments supported increasing the minimum mesh requirements to 12 inches for all vessels that target monkfish. One other comment suggested an unspecified incentive to encourage fishermen to target large fish through gear modifications. Few comments, if any, recognized that the stated purpose of the minimum mesh proposal was to minimize the bycatch of groundfish by monkfish vessels, not to improve size selectivity for monkfish. No one commented on the potential for area-gear closures, as analyzed in the DSEIS (Section 11.6.8.2, pages 145-150). Few comments were received on the potential for using foreign gear technology (Appendix III) to improve size selectivity in the directed monkfish fishery either.

13. **Does the minimum mesh requirement for monkfish trawls apply throughout the net or only in the codend?** The minimum mesh proposal was initially intended to apply throughout the net, but just before taking the draft amendment to public hearing the Councils learned that it was not possible to rig square mesh in the trawl wings and extension. The Councils decided to make the proposal consistent with the multispecies mesh regulations.

    The proposal taken to public hearing would require 10-inch square mesh or 12-inch diamond mesh in the codend and 12-inch diamond mesh in the remaining portion of the net (page 14). This treatment of the codend is consistent with the multispecies regulations that require large mesh in the codend for the exempted monkfish fisheries. The multispecies regulations, however, appear to allow these vessels to use 6-inch mesh in the remainder of the net.

14. **What areas will be opened to fishing for monkfish with 10-inch or 12-inch mesh via the amendment? Alternatively, will the limited access vessels be required to petition the Regional Administrator for exemption from the multispecies days-at-sea regulations?** The documents are unclear on this point, since no areas are being proposed. The percent bycatch of other species on directed monkfish trips is given in Tables 51 and 52 (pages 173 and 174 in the DSEIS).

15. **What should be the net limits for vessels using gillnets for monkfish? How should the net limit be administered and enforced?** The public comments confirmed the committee discussion over net limits. New England fishermen use considerably more nets than do Mid-Atlantic fishermen and the 80-net limit is prohibitively low for New England fishermen.

16. **Should gillnet vessels be required to declare a specific amount of time out of the monkfish fishery? Can they fish other types of gillnets when they declare themselves out of the fishery?** Most comments opposed this proposed measure. The theory behind requiring gillnets to take a specific time out of the fishery is to make the days-at-sea limits have an effect on mortality (88 days would not impact fishermen that only target monkfish during the spring spawning season, 88 days allows day boats to make up to 140 trips per year based on 15 hour days), reduce mortality during spawning, and improve economic yield.

Fishermen argue that this is the only time they can target monkfish, because they are targeting other species in the fall or the weather prevents them from fishing in small boats.

17. **When the fishery exceeds the monkfish TAL, should the Council mainly consider adjusting the regulations affecting the directed fishery, or should meeting the TAL guideline also be a factor for adjusting the multispecies days-at-sea allocations.** Is the status of monkfish separable from that for cod, haddock, and yellowtail flounder?

18. **What will be the expected catch by active multispecies vessels, i.e. will multispecies vessels use unused days-at-sea to target monkfish?** This issue has a large bearing on whether the amendment will be successful in meeting its biological objectives (see issue 8). The analysis of this issue requires access to the 1995 and 1996 landings data, effort data, and days-at-sea usage. The 1996 landings and effort data (Vessel Trip Reports, 1994-1996) are (at the time of public hearings) incomplete.

19. **What will be the effect of the buyback program on monkfish mortality?** Analysis of this issue requires someone to match the monkfish landings records with the permits of vessels in the buyback program. The Council (at the time of public hearings) does not have access to this data.

20. **What would be the net economic impact of the final amendment, if implemented?** The Economic Working Group could not forecast this value for the DSIES, because of the many options within the preferred alternative taken to public hearing in February 1997. NEPA and several other applicable laws require the Council to estimate the net economic effect of the proposed action.

21. **Is there balanced (northern area vs. southern area) representation on the monkfish committee?** This comment was made in several areas, including ports in the northern area, New Bedford, and the Mid-Atlantic.

22. **Who should monitor the status of the monkfish resource after implementation?** The Councils had not determined a process for monkfish monitoring in the preferred alternative, taken to public hearing in February 1997.

In addition to public comment, the Councils received comment in June 1997 from the Regional Administrator, identifying the shortcomings of preferred alternative 3. The major criticisms from NMFS were:

- the specification of a rebuilding schedule
- the equity concerns that result from alternative 3 qualification criteria
- the complexity of the preferred alternative

Second round of public hearings

A second round of public hearings was necessary because the new preferred alternative was more restrictive than any alternative contemplated during the first public hearings in January 1997. The major changes in the plan were to limit the amount of multispecies and scallop days that vessels qualifying for monkfish limited access could use to target monkfish. In the new preferred alternative, all vessels that qualify would be able to use no more than 40 days-at-sea annually to exceed the bycatch allowances and target monkfish. The Councils also advanced the mortality reduction schedule to four years, rather than seven, to allow sufficient time to rebuild the monkfish resource in the mandated 10 year period. Moderate changes to the bycatch allowances and the gillnet limits were included in the new preferred alternative.

The major issues identified by the public at these hearings were:

- Equity between qualifiers and non-qualifiers and between residents of various states
- Discards caused by the proposed trip limits

- Discards caused by the proposed size limits
- Ability to comply with complicated regulations and enforcement costs

The Councils further refined the preferred alternative by modifying the proposed trip limits, advancing the timing of trip limits for limited access monkfish vessels when they are on a monkfish day-at-sea, and reducing the complexity of secondary management measures.

2.2 Areas of Concern

Monkfish mortality during 1990 - 1994 was the highest observed since 1963 -1967 and stock biomass is near the lowest in the 1963 - 1995 time series. Average fish weight has declined considerably during the late 1980s and the 1990s. Due to these circumstances, the northern and southern monkfish stock components are thought to be in an overfished condition and overfishing is occurring.

Although gains in yield per recruit can be achieved by improving size selectivity of the fisheries that catch monkfish, large reductions in catches are needed to reduce fishing mortality below a level believed to achieve population stability. Some mortality reduction can be achieved by discarding small fish, because a substantial fraction survive and may be later recaptured at a larger size. The discard survival rate appears to vary by season, gear, and possibly area.

Fisheries that have significant monkfish bycatches are or will be under restrictive regulations on fishing effort to control mortality or produce rebuilding for target species. The planned effort reduction will reduce bycatch of monkfish in those fisheries, but without controlling increased targeting of monkfish, more of these fisheries' vessels will shift fishing effort to monkfish. The reductions in bycatch will help to reduce fishing mortality on monkfish, but not enough to stop overfishing. Catch restrictions for the directed monkfish fishery are, therefore, needed.

The small size of monkfish caught in the various fisheries is of concern and the proposed management measures are expected to improve yield per recruit and allow greater opportunity for monkfish to spawn. Assessment scientists have concluded that substantial gains in yield per recruit could be achieved by increasing the age at first capture. Another concern is the potential for expansion of the directed fishery if the monkfish resource is fully utilized. Rapid expansion of directed fishing for monkfish is expected under various proposed management alternatives for groundfish, scallops, and summer flounder.

Developing markets for monkfish tails and livers have allowed fishermen to profitably fish for and land increasingly smaller monkfish. Because of high prices for monkfish livers, fishermen can now land small fish under nearly all market conditions. In fact, dealers have been reluctant to take the small monkfish tails, but must do so in order to buy the livers. Landings of excessively small monkfish tails as small as nine inches, and occasionally as small as five inches, are a major concern. If these catches of small and immature monkfish increase, the Councils believe that monkfish will not be given sufficient opportunity to spawn and maintain current yield.

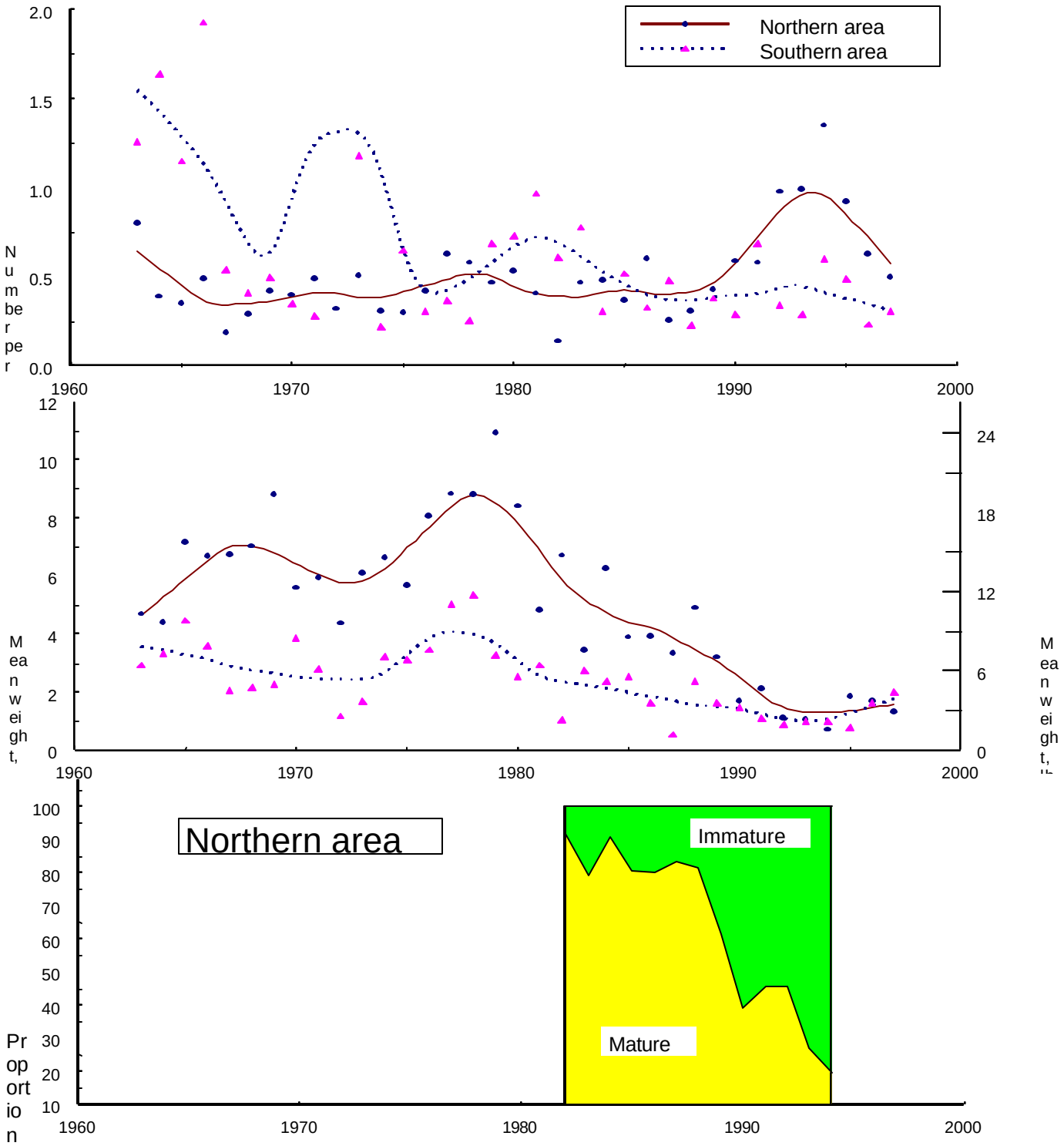

Figure 3. Number per tow, mean fish weight, and proportion of mature females from NEFSC autumn research surveys. The proportion mature represents the fraction of the catch that is over the L50 for female maturation**.**

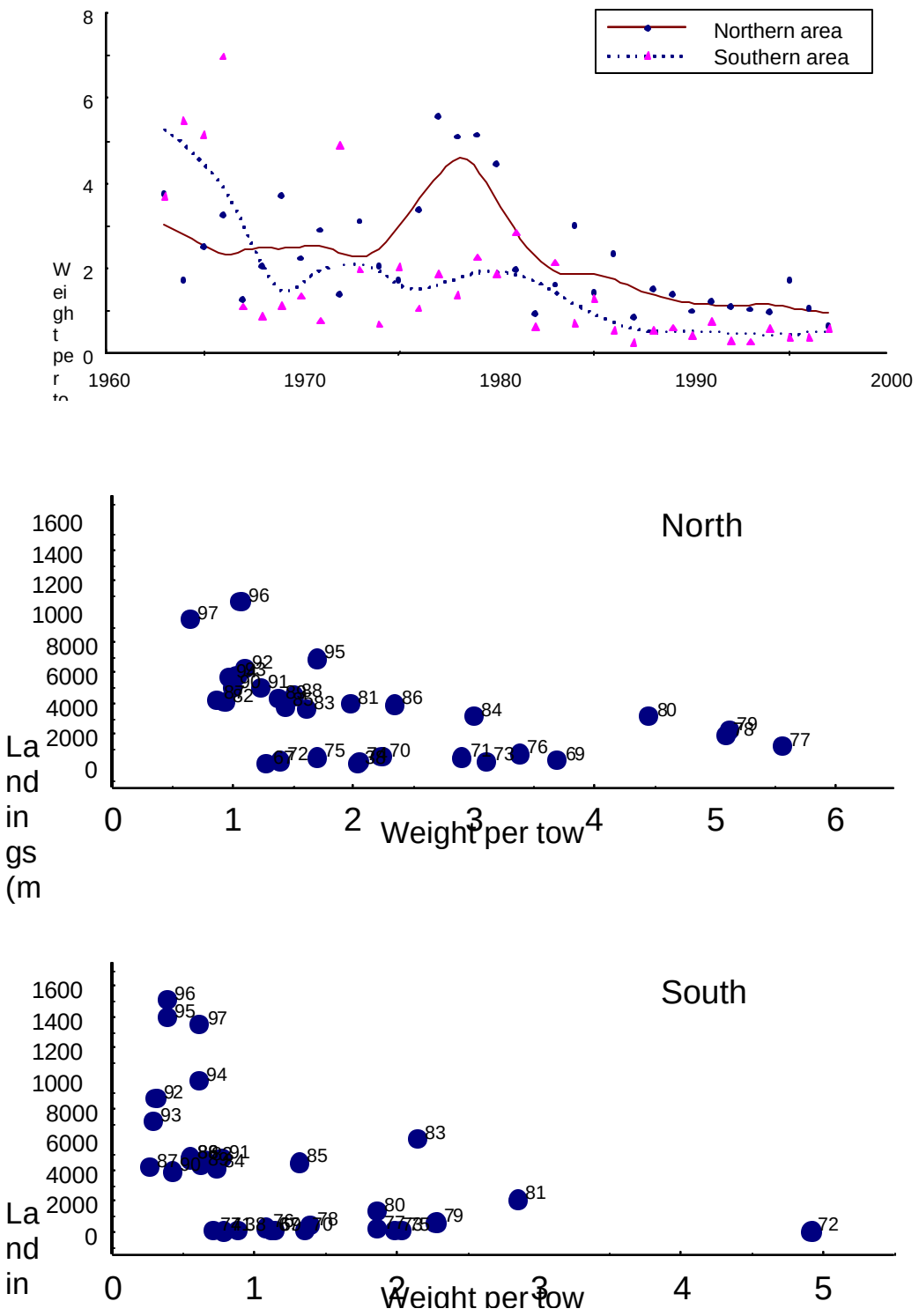

Figure 4. Relative index of biomass from the NEFSC autumn research survey and its relationship to landings, 1963 – 1977.

2.3 Issues to be Resolved

Fishing mortality is above the overfishing threshold and must be reduced to avoid continuing declines in stock biomass. The mortality levels during a period of population stability (1970-1979) were 68 and 78 percent lower than 1990-1995 levels in the Northern Fishery Management Area (NFMA) and the Southern Fishery Management Area (SFMA), respectively (Table 94 and Table 95). Without accounting for improved size selectivity, the total allowable landings would need to be reduced to 4,047 mt and 3,252 mt, respectively, to stop overfishing. The proposed management alternatives have complementary measures that will potentially improve size selectivity, but the magnitude of these improvements is difficult to quantify and depend on changes in fishing behavior. The Councils, therefore, propose a longer-term reduction in total allowable landings and to make adjustments to the TACs as future conditions change.

During the first fishing year beginning May 1, 1999, the Councils are proposing TACs of 5,673 mt and 6,024 mt in the NFMA and the SFMA, respectively (**Table 88**). The catch in the directed and bycatch fisheries has been estimated to be 7,968 and 9,097 mt in the NFMA and SFMA, respectively (**Table 70** and **Table 71**), exceeding these TAC specifications. The first year's limited access allocation would remain constant through year four. In the fourth year, the TACs would decline to 4,047 mt and 3,252 mt for the NFMA and the SFMA, respectively. The quantitative estimate from limited access, days-at-sea allocations, and trip limits in year four indicate that catches could be as high as 5,381 and 4,760 mt in the NFMA and SFMA, respectively (**Table 70** and **Table 71**). Subsequent mortality and TAC reductions may be necessary in years 5 through 9 to achieve the rebuilding biomass targets in year 10.

This estimation, however, only takes into account the expected impacts of limited access, days-at-sea allocations, and trip limits. Other factors that could not be analyzed (e.g. changes in fishing strategies caused by requiring multispecies and scallop vessels to take their monkfish days-at-sea simultaneous to the multispecies and scallop days-at-sea) and other measures that could be estimated independently (e.g. size limits and area closures) account for the quantitative difference. The biological, economic, and social impacts of these measures and the cumulative impacts associated with other plans and regulations are discussed in the Environmental Impact Statement.

Another issue is the acceptance of small monkfish tails in domestic and foreign markets, fishermen will increase fishing effort on the immature fish. The Councils intend to limit the landings of these small fish so that new markets do not develop. In addition, fishermen have stated that, if there were no market incentive to land these fish or the landings were prohibited, they could avoid concentrations of small fish and search for larger fish. This potential change in fishing behavior caused by a minimum size limit is a major conservation benefit of the management program because of high discard mortality. If fishermen continue to fish in these areas, however, a minimum size will be ineffective to control fishing mortality on small fish.

Discarding of small fish to obtain valuable livers is another problem that will occur with a minimum size in place. Because other restrictions on fishing are unlikely to efficiently control the fishing mortality on small monkfish, the Councils are proposing a minimum size. This approach presents an obvious problem because most monkfish are processed at sea, with monkfish tails and livers being landed as separate products. A minimum size, by itself, would allow fishermen to cut the more valuable livers from undersized fish and discard the remaining carcasses, thus mitigating the benefit of the management program. To resolve this problem, the Councils propose a cap on the possession and landings of livers as measured against the amount of monkfish tails landed. This cap is designed to allow the normal prosecution of the fishery and rarely would force fishermen to discard livers from fish over the legal limit. This approach, of course, also requires a liberal limit that fishermen would seldom exceeded unless they were flagrantly discarding small, undersized fish, a situation that the Council wants to avoid.

Another issue is the poor quality of data now being collected. Because of the low value of monkfish tails compared to the livers, significant landings of monkfish tails are sold through untraditional channels and are therefore not reported. It represents a significant data gap when trying to estimate the importance of the fishery and when estimating fishing mortality rates. The Councils are proposing that the mandatory data collection program that exists for other species include monkfish to correct this problem. This reporting requirement would be coupled with a permit requirement for dealers and fishermen to ensure reporting. At-sea processing of monkfish presents another

problem to obtaining size frequency data to assess the resource. The FMP for monkfish, therefore, calls for significant increases in sea sampling to collect the necessary data.

2.4 Management Objectives and Intent of the FMP

The Councils adopted four management goals for monkfish to compliment those required under 50 CFR § 602.11, which address overfishing. The management standard to prevent overfishing is contained in section 4.1 within this document. The Councils intend to address the following goals through implementation of initial management measures to limit mortality and improve size selectivity, where technically feasible:

1) To end and prevent overfishing; rebuilding and maintaining a healthy spawning stock
2) To optimize yield and maximize economic benefits to the various fishing sectors
3) To prevent increased fishing on immature fish
4) To allow the traditional incidental catch of monkfish to occur.

These four goals would ensure adequate spawning and highest possible yields without radically altering the fisheries that target other species or causing extensive regulatory discarding. In addition, they address immediate problems caused by intensified fishing effort for small monkfish.

2.4.1 To end and prevent overfishing; rebuilding and maintaining a healthy spawning stock

The biological objective for monkfish is to lower exploitation so that the resource is no longer overfished (F_{target}, Section 2.4.1.1) and then to rebuild biomass to levels that can produce maximum sustainable yield (MSY). The rebuilding goal is B_{target} , a desirable level of total biomass that would produce significantly higher sustainable landings at a much lower exploitation rate. The biological yield that can be produced at this minimum target biomass and maximum target fishing mortality rate is the optimal yield for monkfish.

B_{target} is equal to the median of the three-year moving average autumn survey weight per tow observations during 1965 to 1981 (Section 2.4.1.1). The domestic fleet often discarded monkfish during this period and the then-active foreign fleet retained all monkfish catches. Once the stock recovers to B_{target} (about three times the current level), the fishery yield could approximate current landings with exploitation at about one-third of the current rate. Catches that the domestic fleet discarded and the foreign fleet landed could be harvested by the domestic fleet for modern markets.

The Councils also adopted a schedule for achieving these objectives. There is considerable uncertainty in the biological parameters, future recruitment, and discard mortality. Taking these factors into consideration, the Councils propose to implement a reduction of fishing effort and improvements in size selectivity to eliminate overfishing in no more than four years. These fishing effort reductions would be achieved by a schedule of TAC (total allowable catch) reductions scheduled over the four-year period. The TACs would serve as a milestone and as a surrogate measure of exploitation, since exploitation rates are difficult to measure and time-consuming to estimate. Section 7.1.5.1.1.1 (EIS) discusses the TACs and their derivation in more detail.

The Councils adopted a rebuilding schedule to achieve these targets in 10 years. Achieving these targets depends on a number of factors including, but not limited to, favorable recruitment and the efficacy of the management measures. These factors are either out of the Councils control or difficult to predict. Future adjustments to the proposed management measures will undoubtedly be necessary to achieve the management targets.

2.4.1.1 Overfishing Definition

All federal fishery management plans must have a definition of overfishing for each species. Most common reference points (B_{MSY}, F_{MSY}, F_{max}, $F_{20\%}$, etc.) that are suitable for other species are problematic for monkfish due to poor data. In the absence of reference points that require high-quality data, the Monkfish Technical Working Group recommended biomass targets and thresholds, based on the survey time series, and fishing mortality rates that existed prior to the rapid increase in monkfish landings. The choice of these reference points is explained below. The New England Council's Overfishing Definition Review Panel (Applegate et al. 1998) furthermore reviewed the proposed reference points.

There are usually two basic ways to define overfishing: methods based on stock abundance ("minimum level of stock biomass") and methods based on threshold mortality rates ("maximum level of fishing mortality"). The minimum stock abundance approach suggests that when a stock falls below a threshold, the risk is unacceptably high that recruitment would be depressed. The threshold mortality rate is based on allowing a minimum proportion of spawners to survive to the following year.

The only data available to support a definition based on a minimum stock level are from fishery-independent surveys. A few state-supported surveys exist, but the most comprehensive are the bottom surveys conducted by NMFS. There are problems because the surveys do not encompass the entire range of the monkfish resource. No samples are taken offshore of the Continental Shelf edge where monkfish are known to occur. These surveys do, however, provide a reasonable estimate of stock abundance for that portion of the population occurring in coastal and shelf areas.

This method utilizes relative abundance to define when a stock is overfished. The survey data is the most complete source of information currently available. A measure of a minimum number or biomass is an attractive definition. On the downside, fishermen often distrust survey data and the survey is subject to interannual changes in availability. The latter may not be problematic for monkfish given its wide range and the extent of the survey, but it does argue for a longer-term approach than action based on one year of survey data.

Often a short-term moving average is compared to a percentile of observations to determine when a population has become depressed. Three criticisms of this approach are generally that overfishing will occur 25% of the time when the lowest quartile is used, that it is reflective of other conditions besides fishing, and that it is reactive rather than proactive. The first is misleading. In actuality, a population must fall below the 8th percentile for its three-year moving average to fall below the 25th percentile. Other relationships exist for various lengths of moving averages. The second criticism is accurate, but the 602 guidelines require management action "whether these trends are caused by environmental changes or by fishing effort." The third criticism may be accurate under certain circumstances. If a stock declined to overfished levels due to high exploitation, that level of fishing mortality probably existed for a significant period of time before the stock reached such low levels. Alternatively, if the stock declined due to other factors, it might not be appropriate to reduce fishing mortality until the population fell below the threshold.

The Council has adopted an overfishing definition that used two indicators, stock biomass and fishing mortality, to determine when monkfish are overfished. The stock would be declared to be overfished when either one of the indicators breaches the established threshold. In addition to thresholds to define overfishing, the definition also incorporates biomass and mortality targets to act as warning milestones when stock conditions should be closely monitored and when more conservative regulations are needed. The Councils' monkfish overfishing definition reads as follows:

> *Monkfish in the northern and southern management areas are defined as being overfished when the three-year moving average autumn survey weight per tow falls below the 33rd percentile of the time series, 1963-1994, or when fishing mortality exceeds $F_{threshold}$. Monkfish are in danger of becoming overfished when the three-year moving average autumn survey weight per tow falls below the median of the three-year moving average during 1965 - 1981 and when fishing mortality is between F_{target} and $F_{threshold}$.*
>
> *For the northern and southern areas, $F_{threshold}$ is based on conditions of stock stability at high abundance, calculated at the fishing mortality rate that prevailed during 1970-1979. F_{target} for the southern area is $F_{0.1}$. For the northern area, F_{target} is currently undefined.*

This definition is one of the first that incorporates the advice given by the NMFS report, "Scientific Review of Definitions of Overfishing in U.S. Fishery Management Plans" and complies with the new Sustainable Fishery Act requirements and National Standard 1 guidelines. It describes overfishing thresholds that should be avoided and management targets to be achieved. The Councils believe that the definition is consistent with National Standard 1 and establishes a management system that will not jeopardize the long-term capacity of the resource and will produce MSY on a continuing basis.

The Councils recognize that the proposed overfishing definition differs slightly from that proposed by the monkfish technical working group. The Council changed the initially recommended target biomass objective from "*the median of observations during 1963 - 1981*" to "*the three-year moving average during 1965 - 1981"* because the original target level appeared to be unachievable. The technical working group recommended (memo dated May 2, 1996) a target biomass level of 2.58 kg/tow and 1.87 kg/tow in the northern and southern management areas, respectively. The joint monkfish oversight committee noted that the three-year moving average was below the target level in the northern management area for 12 of 17 possible years between 1965 and 1981. The three-year moving average fell below the target level in the southern management area for 9 of 17 possible years during the same period.

The committee, therefore, changed the target biomass level to the median of the three-year moving averages. This change lowered the target from 2.58 to 2.29 kg/tow in the northern management area and from 1.87 to 1.84 kg/tow in the southern management area. In the northern area, the three-year moving average fell below its median for 8 of 17 possible years. Similarly, the three-year moving average fell below its median for 8 of 17 possible years in the southern management area, although this event occurred in different years compared to the northern area. In accordance with the Council's objective of managing monkfish in the Gulf of Maine (aka northern area) separately from monkfish from Georges Bank to NC (aka southern area), the overfishing thresholds would be defined individually for each stock component.

Biomass thresholds and targets

Two reference points are established for stock biomass. The median of the research survey index of relative biomass[1] for 1963 - 1981 would be used as a target value. Biomass levels below this median would serve as a warning indicator, when more conservative management measures might be needed. This target survey value is 2.29 kg/tow for the Gulf of Maine and 1.84 kg/tow for the Southern New England/Mid-Atlantic strata. A second, less conservative reference point would be used to declare the stock component to be overfished. This reference point is the 33rd percentile of all weight per tow values in the time series, 1963 - 1994. This threshold survey value is 1.45 kg/tow for the Gulf of Maine and 0.75 kg/tow for the Southern New England/Mid-Atlantic strata. Current

[1] Excludes inshore, coastal strata where the survey catches of monkfish are considerably less frequent.

values (1995) are 0.94 and 0.61 kg/tow, respectively. The current three-year moving averages are 1.01 kg/tow and 0.41 kg/tow, respectively.

Fishing mortality thresholds and targets

Two reference fishing mortality rates (i.e. exploitation) are also established for the overfishing definition. The intent is to propose one value as a target for management that is lower than a second overfishing threshold. This approach would allow a buffer between the goal for management, and a level that should not be exceeded so that recruitment overfishing is prevented. For the southern area, the Council adopted $F_{0.1}$ (0.10) as the target for management. This measure of exploitation would be used as a warning indicator, especially at low or medium levels of stock biomass. For the northern area, the target for management should be less than the $F_{0.1}$ value (0.09), because of the low threshold fishing mortality rate for that area. This target value for the northern area is currently undefined.

Threshold fishing mortality rates are proposed as estimates of F_{rep} , the fishing mortality rate that results in long-term replacement of the stock. These threshold values are estimated as the average mortality rate for a period when monkfish in the two management areas were relatively abundant and stable. Based on biological data from the research survey, the working group recommended that this period should be 1970-1979, the same as was recommended for the TACs calculations. During this period, the average fishing mortality rate for the northern area was 0.051, and for the southern area F was 0.217. F_{rep} would be expected to vary between areas because of differences in stock-recruitment relationships between areas. Lower values of F_{rep} for the northern area could arise from a variety of factors, including higher predation rates on eggs, larvae or juveniles; greater advective losses of eggs or larvae; lower fecundity of spawning adults; or differential cannibalism, for example. It is currently unclear which particular factors are most important in controlling the respective stock-recruitment relationships.

One method of determining fishing mortality for monkfish with existing information is based on numbers at size in NMFS autumn surveys and growth parameters for monkfish in the two areas. This method relies on the number of fish at length captured by fishery-independent survey gear. To estimate fishing mortality, the working group analyzed data in five-year blocks from 1970-1994. Annual surveys within each time period were combined to increase the sample sizes of numbers at length, and to minimize the influence of annual variability in recruitment and catchability. Steeper declines in the number of fish at size translate into higher fishing mortality rates within a given area. The decline in numbers between areas should not be directly compared, because the fishing mortality calculations take into account differential growth parameters. SAW 23 estimated fishing mortality for the latest five-year period, 1991-1995, to be 0.15 for the northern area and 0.51 for the southern area.

Apart from this method, other important indicators of fishing mortality and size-specific pattern of exploitation are available with which to monitor the stock. This method relies on the number of fish at size in sea sampling data. This data is useful to estimate the exploitation pattern and therefore equilibrium biological reference points. The proportion of sexually immature animals comprising the commercial catch is partially a function of the overall exploitation rate. Higher exploitation leads to increasing fractions of immature animals. The expected proportion at each reference point was determined by applying the exploitation pattern, derived from sea sampling data for 1992-1993, and the reference mortality rate at equilibrium. The current proportion of immature monkfish in the catch was estimated by post-stratified expansion of sea sampling observations. This value differs from the expected proportion at status quo because of non-equilibrium considerations. Sampling intensity during this period was barely sufficient to allow the estimation of immature fish in the total commercial catch. Although confidence intervals around these estimates are not currently available, considerable increases in the sampling frequency of at-sea observations would be required to improve this estimate.

Improvements in the analytic basis for mortality rate measurements are contingent upon the development of consistent catch-at-length and associated age data. Very limited historical length and age-composition data are available, owing to the difficulty in sampling landings and discards of monkfish.

Control law

The following diagram helps clarify the structure of the overfishing definition and explains the management advise arising from the overfishing definition when monkfish fall within one of the nine classifications:

Table 3. Monkfish overfishing classifications, risk of recruitment failure, and recommended management actions.

			Target: Median 1963 - 1981	**Threshold: 33rd percentile, 1963 - 1994**	
		Stock biomass (minimum):	Ñ	Ñ	
Fishing mortality (maximum):	Stock condition		High biomass	Medium biomass	Low biomass
	High exploitation	Management advice	Reduce mortality to below $F_{threshold}$	Reduce mortality below $F_{threshold}$ and to F_{target}	Reduce mortality to well below F_{target} until stock recovers[2]
		Risk of recruitment failure	Medium	High	Very high
$F_{threshold}$ ➔	Medium exploitation	Management advice	Maintain mortality below $F_{threshold}$, improve yield per recruit	Maintain mortality below $F_{threshold}$ and reduce F to F_{target}	Reduce mortality below F_{target} until stock recovers[3]
		Risk of recruitment failure	Low	Medium	High
F_{target} ➔	Low exploitation	Management advice	Maintain mortality below $F_{threshold}$	Maintain mortality at or below F_{target}	Maintain mortality below $F_{tarrget}$ until stock recovers[3]
		Risk of recruitment failure	Low	Low	Medium

[2] Stock recovery includes other indicators as noted in text, including proportion of sexually mature fish in the stock, related to age structure.

Although, the monkfish overfishing definition does not contain a formalized control rule that specifies a fishing mortality management strategy, it does have a framework that defines when action should be taken. The shaded areas in the table above represent conditions when the stock would be considered overfished according to the following proposed definition. An overfished condition would require immediate and possibly drastic action to reduce the risk of stock collapse. The area to the right and above the dotted line (at medium exploitation and medium abundance) would be in danger of becoming overfished. Under these conditions, management should take timely but less drastic action to avert overfishing and move back toward the targets.

Monkfish in the Gulf of Maine are at high exploitation levels relative to the mortality threshold and at a low biomass relative to the survey threshold value. Monkfish in Southern New England and the Mid-Atlantic are also at high exploitation levels relative to the mortality threshold and at a low biomass relative to the survey threshold value. Both would therefore be considered overfished. The management advice would be to reduce fishing mortality to well below F_{target}, to allow stock rebuilding, and to close fisheries that catch a high proportion of immature fish.

2.4.1.2 Rebuilding Schedule

Monkfish would be considered to be 'rebuilt' when the stock biomass is above the 1965-1981 average and when fishing mortality is below F_{target}. This condition is determined by the overfishing definition when monkfish would no longer be considered to be "in danger of becoming overfished."

Considering the advice of the TWG and the life history parameters for monkfish, the Councils believe that a rebuilding schedule of ten years can be achieved with the proposed action. Monkfish mature in approximately four years and live to 15-20 years. The TWG furthermore recommended that rapid rebuilding was possible, especially in the Northern Fishery Management Area where high recruitment levels have been recently observed from research survey data. Given the rapid rate of growth early in their lifespan and the recently high recruitment, the Council believes that it is possible to attain a 'rebuilt' status over two times the maturation time, or eight to ten years.

2.4.2 To optimize yield and maximize economic benefits to the various fishing sectors

Optimum yield will be consistent with the definitions under development for the Multispecies FMP. Long-term optimum yield will be the calculated based on the target fishing mortality rates and target biomass levels specified in the overfishing definition. Annual optimum yield targets will be updated annually and calculated according to the following formula as the product of the target fishing morality rate in the overfishing definition times the current stock biomass:

$$OY_t = F_{target} * \overline{B}_t$$

2.4.3 To prevent increased fishing on immature fish

Increased fishing pressure on immature fish would prevent the plan from achieving optimum yield and jeopardize recruitment. Female monkfish mature over a protracted time. Fifty percent of female monkfish mature at about 3 to 4 years of age, having an equivalent tail-length of 11 to 12 inches. Nearly all female monkfish are mature at 6 to 7 years of age, having and equivalent tail-length of 16 to 19 inches. While recruitment in the Northern Fishery Management Area has recently been good, the Councils are concerned about the low fraction of mature females in the monkfish population, which has been estimated as low as 20 percent in the northern area. Higher fishing mortality on immature fish

would allow fewer monkfish to become sexually mature and spawn. Considerable loss in yield-per-recruit would also occur if the fishery targeted smaller fish (NEFSC 1992).

2.4.4 To allow the traditional incidental catch of monkfish to occur

Many vessels in the northeast region target a mixed group of species, of which monkfish is a component. While it is attractive to reduce mortality by inducing effort shifts away from monkfish in these mixed-species fisheries, it is not always possible. These fisheries are likely to continue fishing for the other target species and discard monkfish, unless the reduced monkfish landings made these mixed trips uneconomic. The Councils intent for the FMP is to accommodate these mixed-species fisheries as much as possible within existing regulations, thereby minimizing regulatory discards.

2.5 Purpose and Need

The purpose of the proposed action is to initiate management of monkfish (*Lophius americanus*) pursuant to the Magnuson-Stevens Fishery Conservation and Management Act (MFMCA) of 1976 as amended. On September 30, 1997, the monkfish fishery was determined to be overfished on the basis of inadequate stock level. The Council must therefore prepare and submit a FMP by September 30, 1998 that will stop overfishing and rebuild the monkfish stock within 10 years or less.

Section 304(e) of the MFMCA requires the Secretary of Commerce to annually review "the status of fisheries within each Council's geographical area of authority and identify those fisheries that are overfished or are approaching a condition of being overfished." If the Secretary of Commerce determines that a fishery is overfished, he must "notify the appropriate Council and request that action be taken to end overfishing in the fishery and to implement conservation and management measures to rebuild affected stocks of fish." Upon notification, the appropriate Council must within one year prepare a fishery management plan, plan amendment, or proposed regulations to address these two issues (overfishing and rebuilding). If the Council fails to act, the Secretary of Commerce must prepare a plan or plan amendment to stop overfishing and rebuild the affected stock of fish.

Fishermen and dealers initially became concerned in 1992 about the landings of small fish and requested the Councils to implement management measures to prevent this activity. The Councils' early effort was to develop a management plan to address those concerns. While the Council was working on that plan, it became apparent that the fishing mortality rate was at unsustainable levels and that the stock biomass was very low, compared to the levels observed in the 1960s and 1970s.

The 1997 landings reached an all-time high at 57.5 million pounds, whole weight (or 17.3 million pounds tail-weight). The average tail weight in the landings had declined to 0.9 pounds during 1995-1996. If the mean size of landed monkfish had not appreciably changed in 1997, then about 19 million fish were landed by the commercial fishery. Sea sampling observations, weighted by gear and area, indicate that about 54 percent of the monkfish stock was landed during 1995-1996, or about 16 percent by weight. If the earlier rate of discarding continued in 1997, then about 35 million fish were caught during 1997. The most recent stock assessment (NEFSC 1997), estimated that fishing mortality for monkfish was 0.15 in the Northern Fishery Management Area and 0.51 in the Southern Fishery Management Area, well over the overfishing levels of 0.05 and 0.14, respectively.

Given the rapid increase in landings, the decline in survey biomass indices, and the high exploitation rate compared to the reference points, the Councils are concerned about the status of this resource, because greater fishing effort and the practice of fishing for small fish cannot co-exist. The Councils, therefore, have developed this FMP to stop overfishing within four years of implementation and promote rebuilding to the biomass targets in 10 years, consistent with the new MFMCA requirements.

2.6 Best Scientific Information

National Standard 2 of the Magnuson Act requires the Councils to develop conservation and management measures based on the best scientific information available. Normally, the Councils are able to use existing information about the fishery that is 1 to 1½ years old. Recent changes to management measures have required NMFS to drastically change their data collection system. The Councils have experienced delays in updating this data because of inevitable problems with implementation and execution of the new data collection requirements. The following summary describes the information used to evaluate the proposed management measures and how newer information may affect the results.

The most recent detailed stock assessment was conducted by SAW 23 (NEFSC 1997) during the fall of 1996. This assessment used fishery-dependent and survey data through the end of 1995 to evaluate the status of the monkfish resource. The estimates of fishing mortality trends from 1963 to 1995 were analyzed in five-year blocks to smooth the interannual variation that occurs in a randomized survey. Adding 1997 data would not radically alter the estimates of fishing mortality, although the proportion of monkfish at larger size may still be declining.

In addition to the above survey-based estimates, the 21st SAW included monkfish within its comprehensive assessment of the northeast demersal finfish complex. Most of the analyses in the comprehensive assessment were intended to show broad, long-term trends that were consistent across species. The monkfish indices were not classified by management area, but showed a decline to low levels of biomass through 1987. Since that time, biomass has fluctuated without trend at low levels, while abundance has increased in the Northern Fishery Management Area. The more recent information does not contradict the conclusion of SAW 23 that monkfish are at least fully-exploited and might be over-exploited.

Any biological analyses that depended on gear, time, or area fished were based on dealer, sea sampling, and day-at-sea usage data from 1995-1996, the latest information available. Landings and effort (gear, time, and area fished) data for the commercial fishery are current through 1996. Total landings data included 1997, but detailed information was not yet available to include in many of the impact analyses. The biological model assumed that a multispecies or scallop vessel would use the same number of days in the future as the vessel used during the 1996 fishing year (beginning May 1 for multispecies and March 1 for scallops), unless the 1996 day-at-sea use would exceed future allocations of days. In the latter case, the Councils assumed that the days-at-sea used by a multispecies or scallop vessel would equal its annual allocation, i.e. it would have no unused day-at-sea to target monkfish and would have to forego targeting multispecies or scallops when monkfish fishing is more lucrative.

Since the implementation of mandatory logbooks in 1994, effort data are collected via a different source. When this document was drafted, NMFS had processed the 1994 logbook data. Before releasing the preliminary data for general use, NMFS conducted a comprehensive review through the SAW process to evaluate its consistency with earlier forms of data collection, general accuracy, and utility for stock assessment. SAW 22 raised broad and serious concerns over the accurate representation of the information submitted on the logs. It further recommended that NMFS initiate a process of verification and recovery of the 1994-1996 logbooks.

NMFS has completed its verification and recovery of 1994 to 1996 logbook data, and these data have been used to estimate area fished, amount of gear in use, and soak time. Since 1993, regulations for other species have greatly affected the fishery. These regulations and the decline of other species caused fishing effort on monkfish to intensify and a new evaluation of trip limits would, in some cases, indicate that higher trip limits were necessary to accommodate monkfish catches in mixed fisheries. Bycatch estimates for monkfish, on the other hand, are less sensitive to shifts in fishing effort and may be unaffected by the newer data.

Analyses of the limited access qualification options did not require knowledge of the gear, time, or area fished. When setting the control date for monkfish (February 27, 1995), the Councils considered the impacts of various limited access options with landings (dealer) data through 1994. Since the initial evaluation, landings data were updated and the Council used weighout and dealer data from February 28, 1991 to February 27, 1995 (four years) to determine vessels that would automatically qualify for limited access.

The change in the data collection and processing at NMFS has also affected the processing of data from different sources. Some of the options in this proposed amendment require an analysis of length data from monkfish landed by the commercial fishery. Monkfish are most frequently landed after onboard processing and this makes it difficult for port agents to collect size data. The main source of commercial monkfish size data is from sea sampling. When this document was drafted, sea sampling length data was current through 1996.

Growth rates and maturation information was obtained from Armstrong et al. (1992) and Almeida and Harris (1995). Other life history data included total length to tail length and weight conversions, obtained from Lyons and Creaser (1986) and Wilk et al. (1987), respectively. No information is available for monkfish selectivity in gear with mesh larger than six inches.

Northeast region permit data from NMFS was used to estimate qualification (since vessels with multispecies day-at-sea permits had different criteria) and to evaluate potential impacts. The permit data were current through February 1998 when the Council conducted the biological impact analyses. The benefit-cost analysis (Section 7.1.6) and the analysis of significant action (Regulatory Flexibility Act, Section 1.1) were conducted a little later than the biological analyses and some 1997 data were used in these analyses. During the second round of public hearings, the Councils were given data for New Bedford, MA fishing industry by Dr. Daniel Geogianna. This information was considered when assessing economic and social impacts. There do not appear to be any substantial changes in fishing activity during 1997 that had not been taken into account by the analyses of 1995 and 1996 data.

3.0 PROPOSED MANAGEMENT ACTION

The proposed management action is the Councils' preferred alternative and includes the following primary measures:

a) Qualification criteria for limited access, allocations of days-at-sea to vessels that qualify for limited access
b) Trip limits for vessels on a monkfish day-at-sea, bycatch allowances for vessels not on a monkfish day-at-sea
c) Minimum size limits
d) Gillnet limits
e) Mandatory time out of the fishery during the spawning season
f) A framework adjustment process

Secondary management measures included in the proposed action are:

a) Two management areas for setting biological reference points and implementing differing management measures
b) Restrictions on liver landings to prevent high-grading
c) A "running clock" procedure to administer trip limits without forcing vessels to discard excess monkfish
d) Minimum mesh restrictions to reduce bycatch of groundfish and other species
e) Permitting and reporting requirements (for dealers and limited access vessels)
f) Other measures to ease administration and enforcement

3.1 Limited Access

A moratorium on vessel permits will be implemented effective as of the control date, February 27, 1995. Some vessels will qualify to target monkfish and exceed any applicable bycatch trip limits, based on the vessel's landings history prior to the control date. The Councils intention is to implement the monkfish limited access program as soon as practical, but no later than May 1, 1999, which is the start of the next fishing year. NMFS is encouraged to implement limited access as soon as possible, but the