

**Report of the New England Fishery Management Council's
Multispecies Monitoring Committee**

EXECUTIVE SUMMARY

DAS Usage

DAS usage in fishing year 1999 declined slightly to 52,935 DAS, a 2% decline from 1998. Only 32% of allocated DAS were used, a 2% decline from 1998. As in previous years, allocated DAS greatly exceeded the DAS used. Allocated DAS increased 2.6% to 161,003 DAS. For vessels that used DAS, individual DAS vessels used 87% of their allocated days, fleet DAS vessels used 44% of their allocated days, and hook gear vessels used 19% of their allocated DAS. The decline in DAS used is due to a reduction in DAS used between July through October; DAS usage increased in six of the remaining eight months of the year.

General summary of status of Georges Bank cod, Georges Bank haddock, Georges Bank yellowtail, Southern New England yellowtail and Gulf of Maine cod stocks through 1999

Stock status has improved for Georges Bank cod, Georges Bank haddock, Georges Bank yellowtail, and Southern New England yellowtail (Table 1). Fishing mortality in 1999 for these stocks are below the Amendment 7 overfishing definitions and are near or below the Amendment 7 fishing mortality targets for rebuilding the stocks. Spawning stock biomass has increased for these stocks but remains below Amendment 7 spawning stock biomass thresholds for Georges Bank cod, Georges Bank haddock and Southern New England (Table 1). In general, recent recruitment has been poor for Georges Bank cod, and Southern New England yellowtail. Recruitment has been near average for Georges Bank haddock and above average for Georges Bank yellowtail (Table 1).

The status of Gulf of Maine cod is less clear because of the difficulty with characterizing discards in 1999. Fishing mortality declined to 0.78 in 1998, well above the overfishing definition ($F_{20\%}=0.41$) and Amendment 7 mortality target ($F_{\max}=0.27$). Depending on the magnitude of discards, fishing mortality in 1999 may range from 0.29 (most optimistic with no discards) to 0.76 (assuming 2,500 metric tons of discards). Spawning stock biomass hit a record low in 1998, but increased slightly in 1999 (under all discard assumptions). Recruitment for Gulf of Maine cod has also been poor although early indications suggest an above average 1998 yearclass.

Table 1. Stock status of GB cod, GB haddock, GB yellowtail, SNE yellowtail, and Gulf of Maine cod through 1999 (ND-SD WG 2000).

Stock	1999 $F_{\text{fully recruited}}$ relative to Amend 7 target	SSB	Recent Recruitment	1999 SSB (mts) (%) of Amend 7 threshold Amendment 7 SSB threshold	1999 Biomass (mts) % of Amendment 9 biomass target Amendment 9 biomass target
GB cod	Near target	Low Increasing	Poor, below 25 th percentile.	34,796 mts (SSB) 50% Amend7 threshold =70,000 mts	42,991 mts (mean biomass) 40% $B_{\text{MSY}}=108,000$ mts
GB haddock	Below target	Low Increasing	Slightly above Mean ¹	48,522 mts (SSB) 61% Amend7 threshold =80,000 mts	48,522 mts (SSB) 46% $\text{SSB}_{\text{MSY}}=105,000$ mts
GB yellowtail	Below	Above average Increasing	Above timeseries mean	33,491 mts (SSB) 335% Amend7 threshold =10,000 mts	49,611 mts (mean biomass) 92% ² $B_{\text{msy}} = 54,070$ mts
SNE yellowtail ⁴	Near target	Low Increasing	Poor, slightly above 25 th percentile ³	5,414 mts (SSB) 54% Amend7 threshold = 10,000 mts	6,449 mts (mean biomass) 10% ⁴ $B_{\text{msy}} = 62,870$ mts
GOM cod ⁵	Most optimistic estimate near F_{max} , Likely above.	Low Increasing	Poor but 1998 Year class is above timeseries mean	8,704 mts (SSB) Amend7 threshold not defined	16,947 mts (mean biomass) Approximately 50% $B_{\text{MSY}} = 33,000$ mts

¹ Haddock recruitment timeseries mean 1963-2000. Recruitment prior to 1963 was higher than 1963-2000.

² Georges Bank YT $B_{\text{msy}} = 54,070$ mts. Amendment 9 lists B_{msy} as 46,850 mts.

³ Estimated from NEFSC survey index.

⁴ SNE YT results are based on projecting from 1998 terminal year. B_{MSY} estimate taken from NDWG Report (1999).

⁵ Based on mean of values from sensitivity run. Recruitment, SSB and mean biomass in 1999 do not vary much among sensitivity runs.

Summary of reductions in fishing mortality and landings needed for achieving Amendment 9 rebuilding schedule

Large reductions in F_{1999} are needed to achieve the Amendment 9 control rule rebuilding timeframes for the five major large mesh stocks. The percent reduction by stock are: Georges Bank cod (-58%), Georges Bank haddock (-38%), Southern New England yellowtail (-45%) and Gulf of Maine cod (-65%). Similar reductions in the fully recruited fishing mortality are needed for white hake, American plaice, witch flounder, Georges Bank winter flounder and Cape Cod yellowtail. The average change in fishing mortality needed to achieve the Amendment 9 control rule rebuilding timeframes for all stocks combined is 35%. The mean reduction in fully recruited fishing mortality needed to achieve the Amendment 9 control rule rebuilding timeframes for all stocks combined is 60%.

Similar reductions from 1999 landings are needed to comply with target fishing mortality rates necessary to achieve rebuilding within the Amendment 9 control rule's timeframe. For all species combined, a 30% reduction from 1999 landings is needed to achieve the control rule's rebuilding timeframe. Landings can increase slightly for Southern New England/ Mid-Atlantic winter flounder and increase markedly for Georges Bank yellowtail. The average reduction for all stocks requiring reductions averaged 30% for F_{MSMC} scenarios.

MSMC Options for Fishing Year 2001

The MSMC recommends maintaining status quo measures for fishing year 2001. Georges Bank cod, Georges Bank yellowtail, Georges Bank haddock and Southern New England yellowtail are meeting the Amendment 7 fishing mortality targets.

GOM cod

The MSMC could not determine the state and is therefore is not in the position to recommend changes to the status quo at this time. Further information will be available after the SARC 33 review in June 2001 and further adjustment may be necessary to meet Amendment 7 objectives.

Generic Advice to the NEFMC

In its 1999 report, the MSMC commented on the need for a more comprehensive approach to fishery management, particularly in the Gulf of Maine (MSMC 1999, pp 63-64). Noting that time-area closures which focus on Gulf of Maine cod are likely to result in a re-distribution of fishing effort towards other over-exploited stocks, the MSMC advised the NEFMC to consider the ramifications of management measures, implemented specifically for one stock, on the entire Northeast groundfish complex. In 2000, the MSMC re-iterates this concern. Fishing mortality rates inappropriate for rebuilding are still occurring on such spatially diverse stocks as Gulf of Maine cod, Georges Bank cod, American plaice, white hake, Cape Cod yellowtail, Southern New England yellowtail and Mid-Atlantic yellowtail flounder. All but a few stocks remain well below biomass targets.

As in 1999, the MSMC is advising on target TACs for the upcoming fishing year for 11 stocks in the Northeast groundfish complex under both Amendment 7 and Amendment 9/13 guidelines. Considerable latent effort and fleet capacity remains in the system, and predicting the efficacy of the indirect measures (e.g., trip limits, numerous small area closures) relative to objectives (percent reduction in fishing mortality) is difficult. Given the magnitude of reductions needed to achieve Amendment 9 biomass targets, continuing reliance on indirect measures is likely to result in a repeat of the Gulf of Maine management scenario. This could include initial closures and trip limits, followed by annual adjustments that implement more closures and very restrictive trip limits (and their associated discard problems).

The outcome of the complex indirect measures implemented for Gulf of Maine is not only difficult to predict, but also difficult to measure. For example, the measures, coupled with a lack of adequate at sea monitoring, have increased the uncertainty of the current status of fishing mortality for Gulf of Maine cod. In 1999, the MSMC presented several sensitivity analyses to evaluate the fishing mortality rate in fishing year 1999 (May 1, 1999 to April 30, 2000). Several scenarios were presented in an attempt to evaluate the impact of 200 and 400 pound trip limits then under consideration for the period January-April, 2000 (MSMC 1999, pages 57-59). This analysis was completed using assumptions about unknown 1999 landings and discards, and the effects of trip limits on discarding behavior of individual operators. In 2000, the Northern Demersal/ Southern Demersal working group was unable estimate fishing mortality in 1999 for Gulf of Maine cod because the magnitude of discarding in 1999 could not be quantified. Although reductions in fishing mortality to achieve the F_{max} objective are likely to be required, the MSMC could not provide advice because of uncertainty in the magnitude of the reductions needed. Continual reliance on restrictive trip limits without sufficient at sea monitoring will create similar situations elsewhere. Management measures which control fishing mortality in a direct manner can be evaluated with greater certainty than those currently in place.

The MSMC recommends further **reductions fishing overall fishing effort and fleet capacity** when the Council develops management measures for Amendment 13. The Council should develop systems to encourage choices that reduce fishing capacity and overall fishing effort.

Specific recommendations

Recreational fishing options

The MSMC notes that recreational catch of Gulf of Maine cod remained near 800 metric tons in 1998 and 1999. If future catches by the recreational fishery represents a larger fraction of the total catch than in past, then mortality and rebuilding objectives could be compromised. The MSMC was unable to evaluate the impact of Framework 33's measure requiring party/charter vessels to obtain an exemption certificate to fish in any closed area and prohibition of DAS usage when carrying passengers for hire. The MSMC recommends continual monitoring of recreational landings, and recommends implementing additional measures on the recreational sector to ensure that the proportion of recreational catch does not increase over historic levels. These measures could include prohibiting possession of

cod in closed areas and/or a bag limit could be imposed on party/charter vessels.

Haddock trip limit

Georges Bank Haddock

The trip limit for Georges Bank haddock is May 1- September 30: 3,000 pounds per day, 30,000 per trip; October 1-April 30: 5,000 per day, 50,000 per trip with allowance for Regional Administrator to the adjust trip limit to achieve 75% of the $F_{0.1}$ TTAC. The MSMC did not evaluate the effectiveness of the haddock trip limit liberalization. Although fishing mortality in 1999 (0.16) was below the $F_{0.1}$ Amendment 7 objective (0.26), $F_{0.1}$ is inappropriate for rebuilding to Amendment 9 biomass target. In 1999, the MSMC projected that the fishing mortality that rebuilds to SSB_{MSY} is 0.06. The MSMC notes that the fishing mortality rate for 2001 and 2002 can be liberalized to 0.10 while still achieving rebuilding objectives in 2004. The MSMC recommends against implementing measures that will allow fishing mortality on Georges Bank haddock to increase above status quo ($F=0.16$). The MSMC notes that projected USA landings in 2001 associated with $F_{status\ quo}$ ($=0.16$) are approximately 5,500 metric tons. The MSMC notes that landings associated with 75% of $F_{0.1}$ TTAC is approximately 8,000 mts, well above landings associated with either $F=0.10$ or status quo. The $F_{0.1}$ target TAC is well above a level consistent with rebuilding objectives. Any management measure that allows for increases in fishing mortality above the rebuilding target should not be considered by the Council. Until Target F and associated TAC is adjusted to meet the Amendment 9 rebuilding objectives, the haddock trip limit should not be adjusted in season from the daily limit to reach 75% of the $F_{0.1}$ target TAC.

Gulf of Maine haddock

The current trip limit for haddock is not appropriate for current low biomass of Gulf of Maine haddock. The MSMC notes that landings for Gulf of Maine haddock declined in 1999, likely a result of recent closures in the Gulf of Maine. The concern for Gulf of Maine haddock is twofold: 1) stock size is much smaller than Georges Bank haddock and 2) substantially greater proportion of the effort are shorter duration trips and therefore the change from a 5,000 lbs per day to 50,000 lbs. per trip could result in greater increase in potential landings. Landings and relative exploitation should continue to be monitored to ensure exploitation does not increase on Gulf of Maine haddock.

Access to closed areas

The improved status of Georges Bank yellowtail may create pressure to allow targeting of that species within current closed area. The MSMC notes that the Georges Bank yellowtail target TAC was harvested in 1998 and 1999. Information on fish distribution and bycatch in closed areas is based on limited sampling during narrow time periods. Information on the seasonal changes in the distribution of bycatch species is necessary before expanding any access program beyond the time-periods covered during previous programs when scallop vessels were granted access in closed areas (experimental scallop fisheries and scallop exemption programs). Any program that provides access to closed areas should begin conservatively, and include monitoring of both landings and bycatch of the target and other species (GB cod, GB winter flounder, windowpane, etc.).

The MSMC recommends that any program to allow vessel access to closed areas be done with sufficient monitoring of bycatch to ensure that fishing mortality does not increase on either the target species or bycatch species.

Interaction of the Georges Bank May closure and the Opening of blocks 124 and 125 in May

The MSMC notes that significant effort may have shifted into blocks 124 and 125 when adjacent blocks were closed for GB in May. This is based on industry reports and increases in landings for several inshore Gulf of Maine stocks that occurred in May 2000.

This problem is inherent in area closure management and contributes to the difficulty in analyzing closure impacts on stocks. In the future, interactions among area closures should be taken into account when developing area management options.

General Recommendations:

Technological improvements in the fishery could compromise management based on Days at Sea. Technological improvements that increase fishery catch per unit effort will require more restrictive management measures to achieve and maintain mortality rates at or below rebuilding targets.

The MSMC **supports further experimentation of gear configuration** to improve size and species selectivity. Size-selectivity will become more important as stock biomass and recruitment improves. Current gear is capable of generating significant discards of sub-legal fish. Regulatory discarding will increase as recruitment improves, leading to loss of potential yield and revenue. Improvements in species selectivity may also prove useful for providing protection to a “weak stock” while simultaneously allowing exploitation on species with co-occurring distributions. Enhancing species selectivity in small mesh fishery may improve the likelihood of achieving certification as the large mesh regulated species’ distribution expands and recruitment improves.

The MSMC **recommends that additional at-sea sampling be conducted** to provide estimates of discarding. This is especially important if the Council continues to rely on restrictive trip limits to achieve target fishing mortality rates.

Real time management measures such as in-season adjustments based on trigger mechanism requires real-time data. The present data collection system can not support this approach. Requiring technologies for vessel monitoring systems and real-time reporting (landings, stock area) will provide a better match between data collection and management/assessment needs.

Species Specific Recommendations

Georges Bank cod

MSMC advice for Amendment 7

Fishing mortality is slightly above the A7 target. Fishing mortality should be reduced from 0.22 to 0.18. However, a May closure on Georges Bank may have achieved a reduction in 2000 so that no difference exists between the Amendment 7 target and current F . Although the current assessment suggests that SSB has increased since 1994 primarily due to growth of existing stock at relatively low mortality rates, current SSB is still well below Amendment 7 target and remains extremely low compared to historic biomass.

Continued poor recruitment reduces the potential for stock rebuilding at $F_{0.1}$. Reducing fishing mortality below $F_{0.1}$ will avoid declines in SSB and enhance the probability of long-term rebuilding.

Annual adjustment recommendations for meeting Amendment 7 objectives

MSMC is not recommending any changes to Framework 33 measures specific for Georges Bank cod in 2001.

MSMC advice for Amendment 13

Fully recruited fishing mortality should not exceed 0.09 over the foreseeable future. This mortality rate is projected to achieve B_{msy} by 2004 and should not be exceeded until stock conditions improve (improved recruitment, broadened age structure, higher SSB).

Georges Bank haddock

Amendment 7 advice

Fishing mortality is well below the Amendment 7 target and no reductions in fishing mortality are required. Spawning stock biomass has increased substantially in recent years and is approaching the Amendment 7 target (80,000 mts).

Annual Adjustment recommendations for meeting A7 objectives

MSMC is not recommending any changes to Framework 33 measures specific for Georges Bank haddock in 2001. However, the MSMC does not recommend easing current management measures in order to prevent fishing mortality from increasing.

MSMC advice for Amendment 13

The Amendment 7 fishing mortality rate target ($F_{0.1}=0.26$, fully recruited) is inappropriate for achieving SSB_{MSY} . Based on last year's projection, $F_{MSMC}=0.06$ will achieve SSB_{MSY} with 50% probability by 2004. However, given recent evidence of favorable recruitment, fishing at an $F=0.10$ in 2001 and 2002 will allow for short-term increases in yield without compromising rebuilding to SSB_{MSY} by 2004.

Existing regulations that are intended to ensure that 75% of the Amendment 7 target TAC will be harvested will result in F much higher than 0.10 and compromises rebuilding to Amendment 13 objectives. Taking the yield associated with Amendment 7 will significantly reduce the potential for rebuilding and short-term increase in yield in 2002 and beyond.

Georges Bank yellowtail

MSMC advice for Amendment 7

Fishing mortality is well below the A7 target and no reductions in fishing mortality are required.

Annual Adjustment recommendations for meeting Amendment 7 objectives

MSMC is not recommending any changes to Framework 33 measures specific for Georges Bank yellowtail in 2001.

Amendment 13 advice

The Amendment 7 fishing mortality rate target ($F_{0.1} = 0.25$, fully recruited) is similar to that required (0.27) for rebuilding to B_{MSY} . Current biomass is approaching the B_{MSY} target.

Southern New England yellowtail

Amendment 7 advice

Fishing mortality is slightly above the Amendment 7 target. Fishing mortality should be reduced from 0.30 to 0.27. The difference between the projected current F and the target is not significant. Although the current assessment suggests that SSB has increased since 1994, current SSB is still well below Amendment 7 target and remains extremely low compared to historic biomass.

Annual Adjustment recommendations for meeting A7 objectives

MSMC is not recommending any changes to Framework 33 measures specific for Southern New England YT in 2001.

MSMC advice for Amendment 13

Fully recruited fishing mortality should be as close to zero as practicable over the foreseeable future. Based on recent average landings, the minimum achievable F is 0.17, barring massive closures within the stock area. This mortality rate has less than 42% probability of achieving B_{msy} by 2009. A long-term projection using $F=0.0$ suggested that B_{msy} may be reached in 2009 with 72% probability.

Gulf of Maine cod

Amendment 7 advice

status of fishing mortality in 1999 is uncertain because the level of discards has not been characterized. Fishing mortality in 1999 is likely to be in the range of 0.29 to 0.76 depending on the magnitude of discarding that occurred in 1999. Fishing mortality in 2000 may be in the same range.

Discarding is likely to have increased significantly in 1999 compared to 1998 and if this magnitude of discarding continued in 2000, then measures to reduce catch (landings and discards

converted to landings) will be needed. The severity of the measures necessary to achieve the Amendment 7 target mortality ($F_{MAX}=0.27$) will be based on the magnitude of the discards in 1999 and 2000.

Fishing mortality in 2000 is likely to be no lower than F_{max} and is clearly greater than $F_{0.1}$. MSMC repeats the concern that F_{MAX} is an inappropriate rebuilding target for Gulf of Maine cod's current status and $F_{0.1}$ is a more appropriate rebuilding target. Reductions in fishing mortality are necessary to achieve $F_{0.1}$ under any discard scenario. Depending on the final estimates of discards in 1999 (scheduled for SARC 33 review in spring 2001), some reduction will likely be necessary to achieve F_{max} .

Given the magnitude of the likely reductions required to achieve $F_{0.1}$ (minimum 50% reduction under the no discards scenario), the additions of the November closure of Cashes ledge and January closures of Blocks 124 and 125 are unlikely to achieve $F_{0.1}$.

Annual Adjustment recommendations for meeting A7 objectives:

Because the MSMC can not determine current fishing mortality (1999 and 2000), the MSMC is not in the position to provide a point estimate of target TAC for F_{max} or $F_{0.1}$ for 2001. Given this uncertainty, the MSMC provides two options for a proxy TTAC that can be used to prevent exploitation from increasing beyond status quo. The proxy TTAC can be adjusted after the SARC 33 review provides a better estimate of these TTAC.

Option 1. Use 2,550 mts as a proxy TTAC for the F_{max} target and 1,580 mts as a proxy TTAC for $F_{0.1}$ in 2001 until SARC 33 reviews the assessment.

Option 2. Last year's TTACs could be retained until the updated assessment is available following the SARC 33 meeting in late June 2001.

The MSMC can not recommend any changes to Framework 33 specific to Gulf of Maine cod to achieve the Amendment 7 objectives because of the uncertainty of the magnitude of reduction needed to achieve F_{max} . However, reductions in fishing mortality in 2001 are likely to be required. The magnitude of this reduction will be known after the SARC review of the GOM cod assessment when estimates of F in 1999 and 2000 will be known with better precision. The MSMC notes that development of a Framework adjustment to achieve even F_{MAX} may be required after SARC review of the assessment (June 2001).

To reduce uncertainty in the future, Council should not place heavy reliance on measures that could result in high regulatory discards (e.g., very low trip limits less than 200 lbs) unless adequate at sea monitoring is ensured.

Amendment 13 advice

Fully recruited fishing mortality should not exceed 0.10 over the foreseeable future. This

mortality rate is projected to achieve B_{msy} by 2004 and should not be exceeded until stock conditions improve (recruitment, broadened age structure, higher SSB).

Current estimates of age 1⁺ biomass are near $\frac{1}{2}B_{MSY}$ in 1999 regardless of discard assumptions. However, a large percentage (33%) of age 1+ mean biomass consists of the 1998 yearclass at age 1. This yearclass will be partially recruited to the fishery in 2001 and will be fully recruited in 2002. Achieving low exploitation rates on this yearclass will greatly enhance potential for stock rebuilding.

White Hake

MSMC advice for Amendment 13

Biomass is well below B_{MSY} and fishing mortality is well above the F_{MSY} threshold. Fishing mortality should be substantially reduced to achieve rebuilding. The 1998 yearclass is the third highest in the timeseries and can provide the basis for future rebuilding. Based on the partial recruitment vector estimated in SARC 28, the 1998 yearclass will be 50% recruited in 2001 and fully recruited in 2002. Improving survivorship of the 1998 yearclass, will improve the probability of rebuilding.

The MSMC notes a discrepancy between the Amendment 9 definition of minimum biomass ($\frac{1}{4}B_{msy}$) and minimum biomass threshold estimated by SARC 'xx ($0.30 B_{msy}$). The monitoring committee believes there may be an error in the description of the reference point (i.e $\frac{1}{4} B_{msy}$) in the Amendment 9 text.

American Plaice

MSMC advice for Amendment 13.

Spawning stock biomass is below SSB_{MSY} . Fishing mortality is slightly above the Amendment 9 F_{MSY} threshold (0.19) and over twice the F_{target} (0.11). Both the 1997 and 1998 yearclasses appear to be above average, allowing for rapid rebuilding under low fishing mortality rates. Reducing fishing mortality to the Amendment 9 F_{target} (61% reduction) rebuilds the stock in 2004 with high probability.

Witch flounder

MSMC advice for Amendment 13.

Mean 3⁺ biomass is slightly below B_{MSY} and F (0.12) is near F_{MSY} (0.11) and F_{target} (0.09) in 1999. Exploitation should not be allowed to increase on this stock to allow rebuilding of the age structure and maintain compliance with the Amendment 9 overfishing threshold. The MSMC notes that under $F_{status\ quo}$ is assumed to remain at 0.24 (fully recruited) in 2000 and 2001, but $F_{bio\ wgt}$ is projected to increase (0.15 in 2001) slightly above the F_{MSY} threshold. This is due as good yearclasses enter the exploited phase. This is considerably above the Target F of 0.09.

Georges Bank winter flounder

MSMC advice for Amendment 13.

Biomass is well below either B_{msy} proxy (2.73 kgs/tow) or actual estimate of B_{MSY} (11,400 mts) and is near the minimum biomass threshold. Relative exploitation is below $F_{threshold}$ and near F_{target} for a stock at B_{MSY} . Fishing mortality needs to be reduced substantially from 0.34 in order to rebuild by 2009. F_{MSMC} estimated in 1999 (0.085) rebuilds mean biomass to B_{MSY} in 2006 with 63% probability and 2009 with 85% probability.

MSMC recommends that the Amendment 9 overfishing definition be revised to reflect the quantitative assessment that is now available.

Southern New England/ Mid-Atlantic winter flounder

MSMC advice for Amendment 13.

Biomass is approaching B_{MSY} and is projected to have a 58% probability of achieving B_{MSY} in 2000 under status quo F . $F_{bio\ wgt}$ is below the F_{MSY} threshold and F_{target} . Exploitation may be ratcheted up to F_{target} in small increments while considering impacts on Southern New England yellowtail.

Cape Cod yellowtail stock

MSMC advice for Amendment 13

Biomass is slightly above the biomass threshold but below the B_{MSY} . $F_{bio\ wgt}$ in 1999 is near the F_{target} for a rebuilt stock but fully recruited F in 1999 (0.59) is above F_{max} (0.47) and well above $F_{0.1}$ (0.21). Fishing mortality in 1999 is inappropriate for stock rebuilding and should be reduced by 32% to F_{msmc} (0.40) to allow rebuilding to B_{msy} with 50% probability in 2004.