MID-ATLANTIC FISHERY MANAGEMENT COUNCIL

Mid-Atlantic Fishery Management Council
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Richard B. Robins, Jr., Chairman | Lee G. Anderson, Vice Chairman
Christopher M. Moore, Ph.D., Executive Director

MEMORANDUM

DATE: July 31, 2012

TO: Council

FROM: Jessica Coakley and Kiley Dancy, Staff

SUBJECT: Black Sea Bass Management Measures for 2013, 2014, and 2015

The following materials are enclosed for Council consideration of the above subject:

1) Summary of Monitoring Committee Recommendations (See Summer Flounder Briefing Book Tab)
2) Report of the July Meeting of the Council's Science and Statistical Committee
(See Summer Flounder Briefing Book Tab)
3) Staff Recommendation Memo
4) Black Sea Bass Assessment Summary for 2012
5) Summer Flounder, Scup, and Black Sea Bass Fishery Performance Reports
(See Summer Flounder Briefing Book Tab)
6) Black Sea Bass Advisory Panel Information Document

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Richard B. Robins, Jr., Chairman | Lee G. Anderson, Vice Chairman
Christopher M. Moore, Ph.D., Executive Director

MEMORANDUM

DATE: July 23, 2012

TO: Chris Moore, Executive Director

FROM: Jessica Coakley and Kiley Dancy, Staff

SUBJECT: Black Sea Bass Management Measures for 2013, 2014, 2015

Executive Summary

Based on the July 2012 assessment update, the black sea bass stock is not overfished and overfishing is not occurring. The 2011 stock is at 102% (based on a deterministic model) or 99% (based on a stochastic model) of the spawning stock biomass at maximum sustainable yield (SSB_{MSY}). Staff recommend black sea bass specifications be set for 3 years (2013, 2014, 2015), and that the acceptable biological catch (ABC) and associated catch limits be held constant because of increasing projection uncertainty for that period. The staff recommendation for ABC is 4.57 million lb (2,073 mt) for 2013, 2014, and 2015. This is the same ABC that was recommended by the Council's Scientific and Statistical Committee (SSC) in 2010, 2011 and 2012. Staff recommend a commercial ACL and recreational ACL of 2.16 million lb (981 mt) and 2.41 million lb (1,092 mt), respectively. Staff also recommend a commercial annual catch target (ACT) of 2.16 million lb (981 mt) for 2013, a commercial quota less 3% research set-aside (RSA) of 1.80 million lb (818 mt), a recreational ACT of 2.17 million lb (983 mt), and a recreational harvest limit less 3% RSA of 1.69 million lb (766 mt) for 2013. Staff do not recommend any change to the current minimum fish size (11 inch-TL) or gear requirements (4.5 inch mesh with 500/100 lb trigger; current pot/trap vent requirements). In addition, staff recommend up to 3% of the total allowable landings (TAL) be made available to the RSA.

Introduction

The Magnuson-Stevens Act (MSA) requires each Council's Scientific and Statistical Committee (SSC) to provide, among other things, ongoing scientific advice for fishery management decisions, including recommendations for ABC, preventing overfishing, and maximum sustainable yield. The Council's catch limit recommendations for the upcoming fishing year(s) cannot exceed the ABC recommendation of the SSC. In addition, the fishery management plan (FMP) established Monitoring Committees which develop recommendations for management measures designed to achieve the recommended catch limits. The SSC will recommend an ABC for black sea bass that addresses scientific uncertainty and the Monitoring Committee will focus on recommending measures to address management uncertainty (ACTs). Based on the SSC and Monitoring Committee recommendations, the Council will make a recommendation to the National Marine Fisheries Service (NMFS) Northeast Regional Administrator. Because the FMP is cooperatively managed with the Atlantic States Marine Fisheries Commission, the Commission's Summer Flounder, Scup, and Black Sea Bass Board will meet jointly with the Council to recommend black sea bass management measures. In this memorandum, information is presented to assist the SSC and Monitoring Committee in developing recommendations for the Council and Board to consider for the 2013, 2014, and 2015 fishery for black sea bass.

Additional relevant information about the fishery and past management measures is presented in the Fishery Performance Report for black sea bass developed by the Council and Commission Advisory Panels, as well as in the corresponding Black Sea Bass Information Document prepared by Council staff.

Catch and Landings

Based on the assessment update, the 2011 commercial and recreational landings were 1.15 million lb (520 mt) and 1.68 million lb (764 mt), respectively. The 2012 commercial landings as of the week ending July 14, 2012, indicate that 72% of the coastwide commercial quota has been landed (Table 1).

Table 1. The 2012 black sea bass quotas and the amount of black sea bass landed by commercial fishermen, in lb, in each state.

	Commercial			Research
State	**Cumulative Landings (lb)[a]**	**Quota (lb)**	**Percent of Quota (%)**	**Set-Aside Landings (lb)a**
ME	0			0
NH	0			0
MA	253,262			5,667
RI	130,821			1,757
CT	15,191			276
NY	86,223			10,708
NJ	175,844			973
DE	53,787			0
MD	121,411			0
VA	352,146			632
NC	48,704			0
Other	0			0
Totals	**1,238,389**	**1,710,000**	**72**	**20,013**

[a] Quotas adjusted for research set-aside and overages. Source: NMFS Weekly Quota Report for week ending July 14, 2012.

Regulatory Review

In July 2011, the SSC met to recommend an ABC for black sea bass for fishing year 2012. The overfishing limit (OFL) for 2012 was derived directly from the stock assessment based on an F_{MSY}

proxy of $F_{40\%}$ = 0.42, and the OFL was specified as 7.8 million lb (3,551 mt) for 2012 (derived as the 50th percentile of yield at $F_{40\%}$ = 0.42). The SSC was concerned about the high uncertainty in the OFL that was not well characterized in the assessment. The SSC recommended an ABC of 4.5 million lb (2,041 mt) in 2012. This recommendation was based on catch history rather than on fishing mortality (F), and was the same ABC recommended for 2010 and 2011. The SSC considered black sea bass to be a level 4 assessment (based on control rules in the proposed Omnibus Amendment), and considered the following to be the most significant sources of uncertainty: atypical life history strategy (protogynous hermaphrodite); strong annual retrospective pattern in biomass evident in recent years; uncertainty in stock status because of the lack of uncertainty estimation for the biological reference points (proxy used for FMSY) and model output; assessment assumption of a completely mixed stock, despite tagging analyses suggesting otherwise; uncertainty with respect to M (because of the unusual life history strategy the current assumption of a constant M in the model for both sexes may not adequately capture the dynamics in M); no uncertainty characterization for the OFL; and concern about the application of trawl calibration coefficients (ALBATROSS IV vs BIGELOW) and their influence on the selectivity pattern and results of the assessment.The associated 2012 commercial quota was 1.71 million lb (776 mt) and the recreational harvest limit was 1.32 million lb (599 mt).

Management measures in the commercial fishery other than quotas and harvest limits (i.e., minimum fish size, gear requirements, etc.) have remained constant since 2006.

Biological Reference Points

The biological reference points for black sea bass were updated as part of the 2012 assessment update, as the result of several changes made to the information incorporated into the SCALE model. The length-based yield per recruit model was updated using both stochastic and deterministic approaches. The updated fishing mortality threshold for black sea bass is $F_{MSY} = F_{40\%}$ (as F_{MSY} proxy) = 0.44. Using the deterministic approach, SSB_{MSY} is estimated to be at 24.0 million lbs (10,880 mt), and with the stochastic approach, SSB_{MSY} is at 24.9 million lb (11,300 mt). The minimum stock size threshold, one-half SSB_{MSY} is estimated to be 12.0 million lb (5,440 mt) using the deterministic approach, and 12.5 million lb (5,650 mt) using the stochastic approach.

Stock Status and Projections

The most recent accepted benchmark assessment on black sea bass was peer-reviewed and accepted in December 2008 by the DPSWG Peer Review Panel. Documentation associated with this assessment and previous stock assessments, such as reports on stock status, including annual assessment and reference point update reports, Stock Assessment Workshop (SAW) reports, and Stock Assessment Review Committee (SARC) panelist reports, are available online at the NEFSC website: http://www.nefsc.noaa.gov/saw/.

The July 2012 assessment update indicates the black sea bass stock is not overfished and overfishing is not occurring, relative to the biological reference points. Fishing mortality (F_{MULT}) in 2011 is F = 0.21, below the fishing mortality threshold of F=0.44. Total stock biomass in 2011 was estimated at 28.0 million lb (12,700 mt), above the deterministic B_{MSY} but slightly below the stochastic value. SSB in 2011 is estimated at 24.6 million lb (11,145 mt), a decrease from 11,653 in 2010. 2011 SSB was at

102% of SSB_{MSY} as estimated using the deterministic approach, and 99% of the stochastic value of SSB_{MSY}. Recruitment estimated by the model was relatively constant through the time series with the exception of the 1999 and 2001 year classes. These cohorts appeared to be the driving force behind the increase in biomass and SSB. The estimated average recruitment (age one) in 2011 (2010 cohort) was 21.0 million fish.

Basis for 2013, 2014, 2015 ABC Recommendation

Input through the Council's Visioning process and Fishery Performance Reports prepared by the Advisory Panel highlight stakeholder interest in having stable fishery management measures; therefore, staff recommend black sea bass specifications be set for 3 years, 2013, 2014, and 2015. Staff recommend that the 2013 ABC be applied to 2014 and 2015 as well. A 3-year constant catch (ABC) approach should provide a more conservative and stable method for setting multi-year ABCs, when compared to setting increasing or decreasing ABCs over the period in response to changes in projected F and SSB.

The recommended OFL for 2012 of 7.00 million lb (3,175 mt) is defined by the fishing mortality threshold of F=0.44. It is clear that recommendations for ABC, which would equal the OFL, would not account for any scientific uncertainty associated with estimation of OFL and the assessment of the black sea bass stock. The DPSWG Panel noted despite acceptance of the assessment model there was *"considerable uncertainty with respect to stock status*." In addition, the Panel recommended that, *"management should proceed with caution until the implications of recent rapid changes from high to low index values observed in the survey, but not in model estimates of time series, are more adequately understood."* The review Panel also, *"recommends the SSC recognize and allow for the sizeable uncertainty in stock status when establishing catch limits."* Last year, the SSC classified the black sea bass assessment as level 4, and applied a constant catch approach to setting ABC. Given the significant sources of uncertainty in the assessment of black sea bass described last year by the SSC, and its classification as a level 4 assessment, and the absence of new information that suggest stock status has changed, staff recommend an ABC of 4.57 million lb (2,070 mt) for 2012 which is about the same ABC applied to this fishery in 2010-2012 (Table 2). The ABC is slightly higher (+70,000 lb) as presented in the assessment update. This ABC is about 65% of the OFL. Based on projections at this ABC for 2013, the stock is expected to continue to remain stable at a projected 2014 SSB of 23.8 million lb (10,795 mt), but below both the deterministic and stochastic SSB_{MSY}. Applying this same ABC to 2014 and 2015 would not be expected to result in overfishing of the stock given the current stock conditions.

Other Management Measures

Recreational and Commercial ACLs

In the Omnibus Amendment, the ABC is equivalent to the total allowable catch (TAC) and the sum of the commercial and recreational ACL equals the ABC (Figure 1).

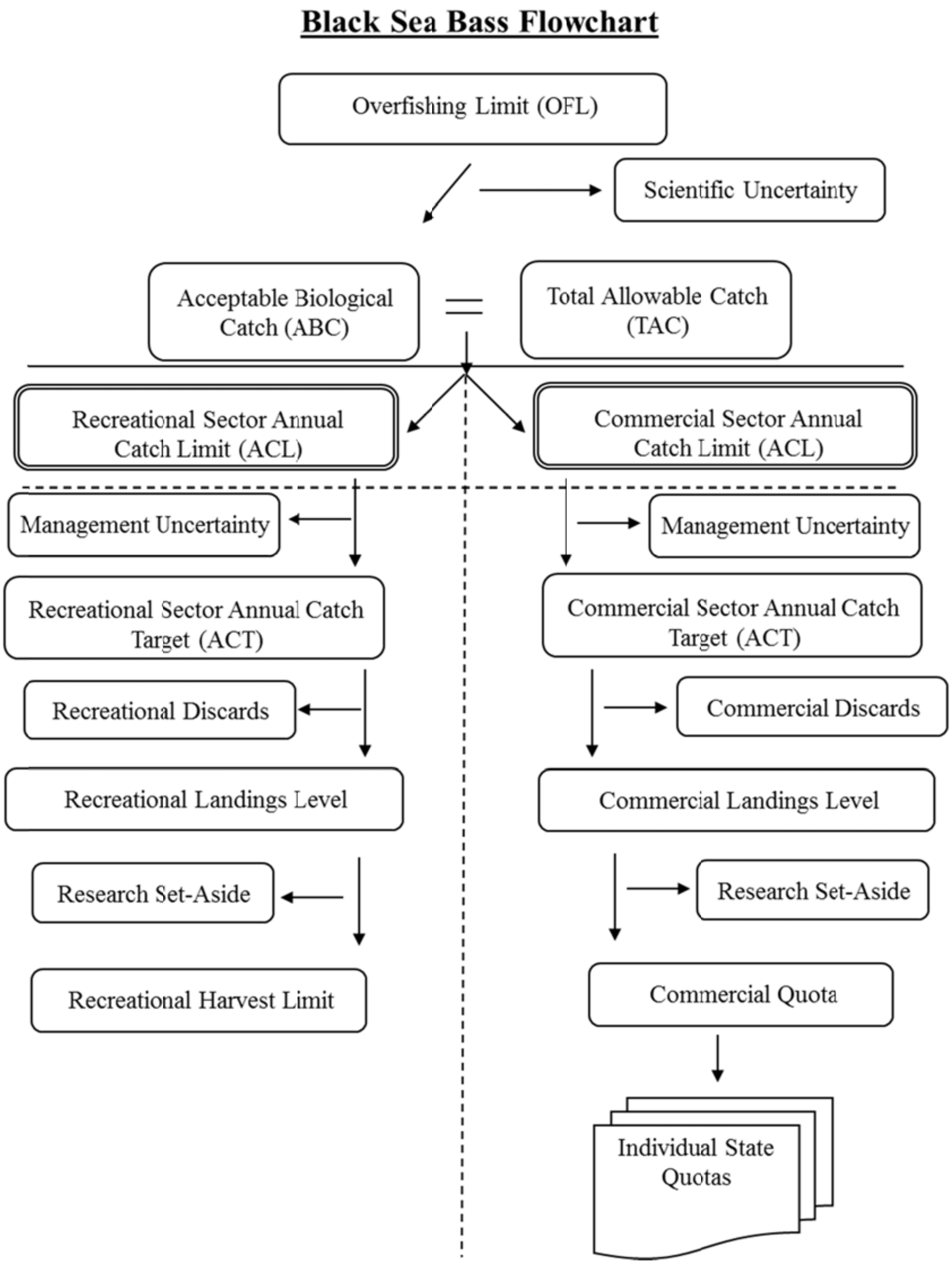

Figure 1. Black sea bass catch and landings limits.

An ABC of 4.57 million lb (2,070 mt) is comprised of both landings and discards. Based on the allocation percentages in the FMP, 49% of the landings are allocated to the commercial fishery, and 51% to the recreational (Table 2). Discards are apportioned based on the contribution from each fishing sector using the 2010-2011 average ratios; 61% of dead discards are attributable to the recreational fishery, 39% to the commercial.

Table 2. Allocation of the black sea bass ABC to the commercial and recreational ACLs for 2013, 2014, and 2015 (Staff recommended).

	Catch (Landings + Discards)	Landings Portion	Discards Portion
ABC	4.57 mil lb (2,073 mt)	3.79 mil lb (1,721 mt)	0.78 mil lb (352 mt)
Recreational ACL	2.41 mil lb (1,092 mt)	1.94 mil lb (878 mt)	0.47 mil lb (215 mt)
Commercial ACL	2.16 mil lb (981 mt)	1.86 mil lb (843 mt)	0.30 mil lb (137 mt)

Considerations for ACTs

As described in the Omnibus Amendment, the Black Sea Bass Monitoring Committee will be responsible for recommending ACTs for the Council to consider. The relationship between the recreational and commercial ACTs, and other catch components (current and proposed) are given in Figure 1. The Committee may provide other recommendations relevant to setting catch limits consistent with the MSA. The Monitoring Committee can consider all relevant sources of management uncertainty in the black sea bass fishery and provide the technical basis, including any formulaic control rules, for any reduction in catch when recommending an ACT. The ACTs, technical basis, and sources of management uncertainty would be described and provided to the Council. Management uncertainty is comprised of two parts: uncertainty in the ability of managers to control catch and uncertainty in quantifying the true catch (i.e., estimation errors). Management uncertainty can occur because of a lack of sufficient information about the catch (e.g., due to late reporting, underreporting, and/or misreporting of landings or bycatch) or because of a lack of management precision (i.e., the ability to constrain catch to desired levels).

The recent year sector-specific landings performance indicates that the recreational fishery had been somewhat variable in its performance relative to the harvest limits (Table 3). The proportional standard error on coastwide black sea bass recreational catch (based on MRIP) is 10%. Because this serves as an indicator of the variability of the data, <u>staff recommend an 10% reduction in catch from the recreational ACL to address potential imprecision in observed catch estimates relative to the catch target for 2013. This would result in a recreational ACT of 2.17 million lb (983 mt). The staff recommend the commercial ACL equal the commercial ACT because of the performance of commercial fishery and quota monitoring systems in place.</u>

Table 3. Black sea bass commercial and recreational fishery performance relative to quotas and harvest limits, 2007-2011.

Year	Commercial Landings (mil lb)[1]	Commercial Quota (mil lb)	Percent Overage(+)/ Underage(-)	Recreational Landings (mil lb)[1]	Recreational Harvest Limit (mil lb)	Percent Overage(+)/ Underage(-)
2007	2.240	2.377	-2%	2.229	2.474	-10%
2008	1.883	2.206	-15%	1.571	2.108	-25%
2009	1.182	1.093	+8%	2.313	1.138	+103%
2010	1.676	1.759	-5%	2.979	1.830	+63%
2011	1.684	1.711	-2%	1.146	1.781	-36%
5-yr Avg.	-	-	-3%	-	-	+19%

[1]Based on the July 2012 assessment update.

Commercial Quota, Recreational Harvest Limit, and Research Set-Aside

The landings-based allocations (i.e., 49% commercial, 51% recreational) were maintained in the derivation of the sector-specific ACLs and ACTs, such that the sum of the sector-specific TALs (commercial or recreational landings levels) will be equal to overall TAL (Table 2). <u>Based on the staff recommended ACTs given above and a recommended 3% research set-aside deduction, the commercial quota would be 1.80 million lb (818 mt) and the recreational harvest limit would be 1.69 million lb (766 mt)</u>. The ASMFC allocates the commercial quota to each state based on the allocation percentages given in Table 4.

Table 4. The Commission state-by-state commercial allocation percentages.

State	Allocation (percent)
ME	0.5
NH	0.5
MA	13.0
RI	11.0
CT	1.0
NY	7.0
NJ	20.0
DE	5.0
MD	11.0
VA	20.0
NC	11.0
Totals	100

Specific management measures that will be used to achieve the harvest limit for the recreational fishery in 2013 will not be determined until after the first four waves of 2012 recreational landings are reviewed. These data will be available in October 2012. The Monitoring Committee will meet in November 2012 to review these landings data and make recommendations regarding changes in the recreational management measures (i.e., possession limit, minimum size, and season). The Committee may also meet in November 2013 and 2014 to recommend adjustments to recreational measures for the 2014 and 2015 fishing years. Given the performance of the recreational fishery relative to the recreational harvest limit in recent years, management measures (i.e., minimum size, possession limits, and seasons) should be implemented that are designed to achieve the recreational ACT, while preventing the recreational ACL from being exceeded.

Gear Regulations and Minimum Fish Size - Commercial Fishery

Amendment 9 established minimum fish size for black sea bass in federal and state waters. The Council and Commission increased the size limit to an 11 inch-TL in 2002. Staff recommend that the size limit remain at 11 inch-TL. Amendment 9 also established gear regulations that became effective on December 16, 1996. The Council and Commission recommended a change in the mesh size for 2002. Current regulations state that large trawl nets are required to possess a minimum of 75 meshes of 4.5 inch diamond mesh in the codend, or the entire net must have a minimum mesh size of 4.5 inch throughout. The threshold level used to trigger the minimum mesh requirement size is 500 lb from January through March and 100 lb from April through December. Staff recommend no change in these trawl mesh regulations.

The Council and Commission adopted modifications to the circle vent size in black sea bass pots/traps based on the findings of a Council and Commission sponsored workshop which became effective January 1, 2007. The minimum circle vent size requirements for black sea bass pots/traps were increased from 2 $^{3}/_{8}$ inch to 2 $^{1}/_{2}$ inch. The requirements of 1 $^{3}/_{8}$ inch x 5 $^{3}/_{4}$ inch for rectangular vents and 2 inch for square vents remained unchanged. In addition, 2 vents are required in the parlor portion of the pot/trap. Staff recommend no change in these pot/trap regulations.

Mid-Atlantic Fishery Management Council

Black Sea Bass AP Information Document[1] - June 2012

Management System

The Fishery Management Plan (FMP) for black sea bass became effective in 1997 when it was incorporated into the Summer Flounder and Scup FMP. The FMP established the management unit for black sea bass (*Centropristis striata*) as the U.S. waters in the western Atlantic Ocean from Cape Hatteras, North Carolina northward to the U.S.-Canadian border as well as measures to ensure effective management of the black sea bass resource. There are two management entities that work cooperatively to develop fishery regulations for black sea bass: the Atlantic States Marine Fisheries Commission (ASMFC) and the Mid-Atlantic Fishery Management Council (MAFMC), in conjunction with the National Marine Fisheries Service (NMFS) as the federal implementation and enforcement entity. The cooperative management endeavor was developed because a significant portion of the catch is taken from both state (0-3 miles offshore) and Federal waters (3-200 miles offshore). The commercial and recreational fisheries are managed using catch and landings limits, commercial quotas, recreational harvest limits, minimum fish sizes, gear regulations, permit requirements, and other provisions as prescribed by the FMP. Black sea bass was under a stock rebuilding strategy and was declared rebuilt in 2009. The FMP, including subsequent Amendments and Frameworks, is available on the Council website at: http://www.mafmc.org/fmp/fmp.htm

Basic Biology

Information on black sea bass life history and habitat requirements can be found in the documents titled, "Essential Fish Habitat Source Document: Black Sea Bass, *Centropristis striata*, Life History and Habitat Characteristics" (Steimle et al. 1999) and an update of that document, "Essential Fish Habitat Source Document: Black Sea Bass, *Centropristis striata*, Life History and Habitat Characteristics" (Drohan et al. 2007), and is summarized here. Electronic versions are available at the following website: http://www.nefsc.noaa.gov/nefsc/habitat/efh/

The northern population of black sea bass spawns in the Middle Atlantic Bight over the continental shelf during the spring through fall, primarily between Virginia and Cape Cod, Massachusetts. Spawning begins in the spring in the southern portion of the population range, i.e., off North Carolina and Virginia, and progresses north into southern New England waters in the summer-fall. Collections of ripe fish and egg distributions indicate that the species spawns primarily on the inner continental shelf between Chesapeake Bay and Montauk Pt., Long Island. The duration of the larval stage and

[1] Data employed in the preparation of this document are from unpublished National Marine Fisheries Service (NMFS) Dealer, Vessel Trip Reports (VTRs), Permit, and Marine Recreational Statistics (MRFSS/MRIP) databases, as of June 2012, unless otherwise noted.

habitat-related settlement cues are unknown; therefore, distribution and habitat use of this pelagic stage may only partially overlap with that of the egg stage. Adult black sea bass are also very structure oriented, especially during their summer coastal residency. Unlike juveniles, they tend to enter only larger estuaries and are most abundant along the coast. Larger fish tend to be found in deeper water than smaller fish. A variety of coastal structures are known to be attractive to black sea bass, including shipwrecks, rocky and artificial reefs, mussel beds and any other object or source of shelter on the bottom. In the warmer months, inshore, resident adult black sea bass are usually found associated with structured habitats. During the summer, adult black sea bass share complex coastal habitats with other fishes including tautog, hakes, conger eel, sea robins and other transient species. EFH for black sea bass is pelagic waters, structured habitat (e.g., sponge beds), rough bottom shellfish, and sand and shell, from the Gulf of Maine through Cape Hatteras, North Carolina.

Black sea bass attain a maximum size of around 60 cm (23.6 in) and 4 kg (8.8 lb), with a maximum age for females of 8 and age 12 for males (NEFSC 2009). Maturity data is routinely collected on Northeast Fisheries Science Center survey cruises and model estimates for length suggest 50 percent maturity occurs at 20.4 cm (8.0 inches) with 95 percent maturity attained by 28 cm (11.0 inches).

Adult black sea bass are generalist carnivores that feed on a variety of infaunal and epibenthic invertebrates, especially crustaceans (including juvenile lobster, crabs, and shrimp), small fish, and squid. The Northeast Fisheries Science Center (NEFSC) food habits database lists the spiny dogfish, Atlantic angel shark, skates, spotted hake, summer flounder, windowpane, and goosefish as predators of black sea bass.

Status of the Stock

A statistical catch at length (SCALE) model was used in the most recent peer-reviewed and accepted black sea bass stock assessment (NEFSC 2009; Data Poor Stock Working Group (DPSWG) Peer Review Panel). Reports on "Stock Status," including annual assessment and reference point update reports, Stock Assessment Workshop (SAW) reports, Stock Assessment Review Committee (SARC) panelist reports, and DPSWG reports and peer-review panelist reports are available online at the NEFSC website: http://www.nefsc.noaa.gov

Based on the June 2011 update, the stock is not overfished and overfishing is not occurring, relative to the DPSWG biological reference points. Fishing mortality (F_{MULT}) in 2010 was F = 0.41, an increase from F=0.32 in 2009 (Figure 1). This point estimate of F in 2010 is very close to the fishing mortality threshold of F=0.42. Estimates for 2010 total biomass remain above B_{MSY}. SSB in 2010 was 30.7 million lb (13,926 mt), which is 111% of SSB_{MSY} (27.6 million lb, 12,537 mt; Figure 2). Recruitment estimated by the model was relatively constant through the time series with the exception of the 1999 and 2001 year classes. These cohorts appeared to be the driving force behind the increase in biomass and SSB. The estimated average recruitment (age one) in 2010 (2009 cohort) was 26.8 million fish.

The DPSWG Panel noted that despite acceptance of the assessment model there was "*considerable uncertainty with respect to stock status*." In addition, the Panel recommended that, *"management should proceed with caution until the implications of recent rapid changes from high to low index values observed in the survey, but not in model estimates of time series, are more adequately understood."* The review Panel also, "*recommends the SSC recognize and allow for the sizeable uncertainty in stock status when establishing catch limits."*

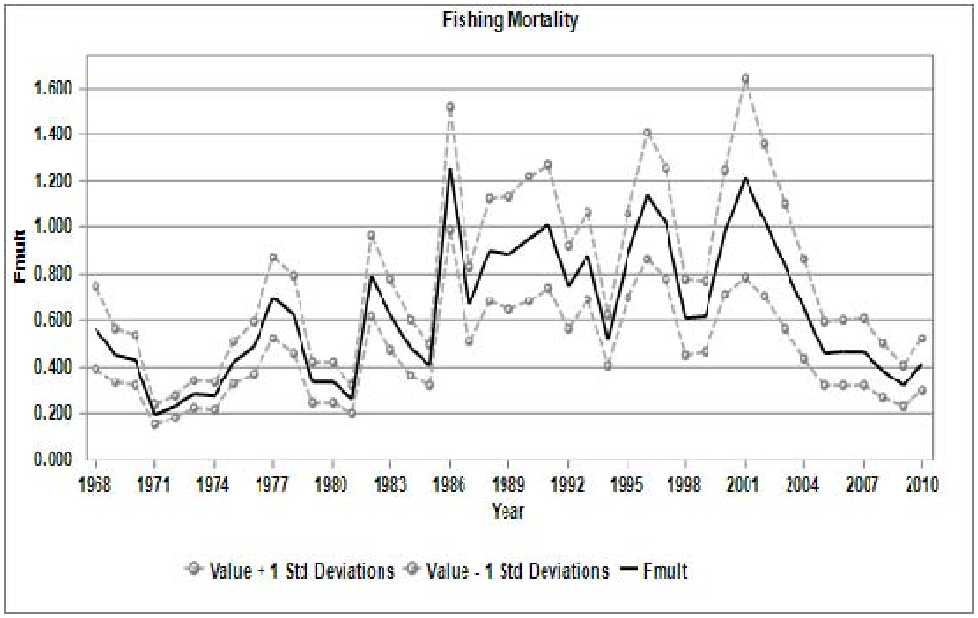

Figure 1. Estimated fishing mortality of black sea bass from SCALE model update, 1968-2010.

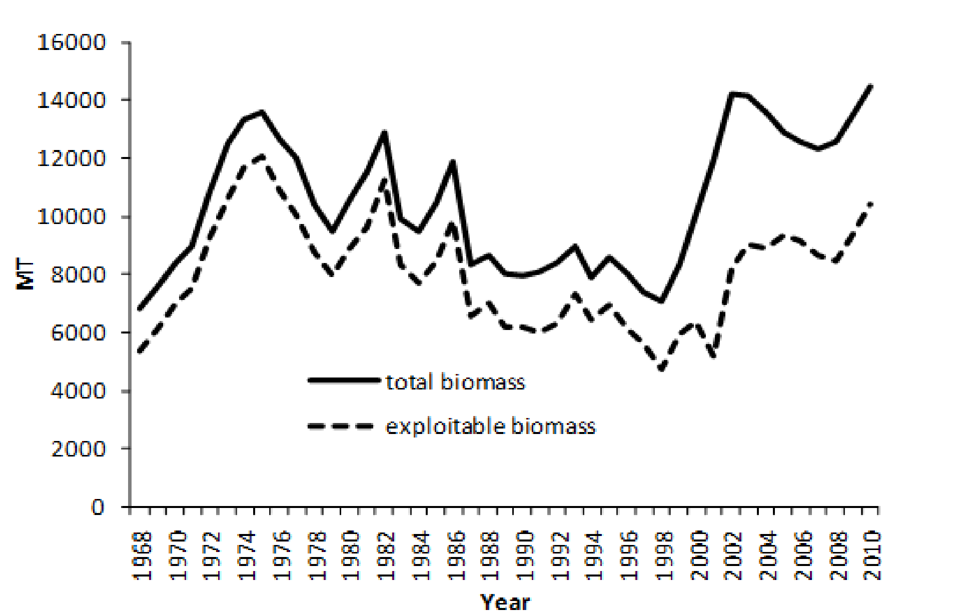

Figure 2. Estimated black sea bass total and exploitable biomass (mt) from SCALE model update, 1968-2010.

Fishery Performance

There are significant commercial and recreational fisheries for black sea bass. Black sea bass is managed primarily using output controls (catch and landings limits), with 49 percent of the landings being allocated to the commercial fishery as a commercial quota and 51 percent allocated to the recreational fishery as a recreational harvest limit.

Commercial Fishery

In Federal waters, commercial fishermen holding a moratorium permit may fish for black sea bass. Permit data for 2011 indicate that 799 vessels held commercial permits for black sea bass. Total landings (commercial and recreational) peaked in the late 1980's at over 16 million lb, and in 2011 were about 3.0 million lb total (Figure 3).

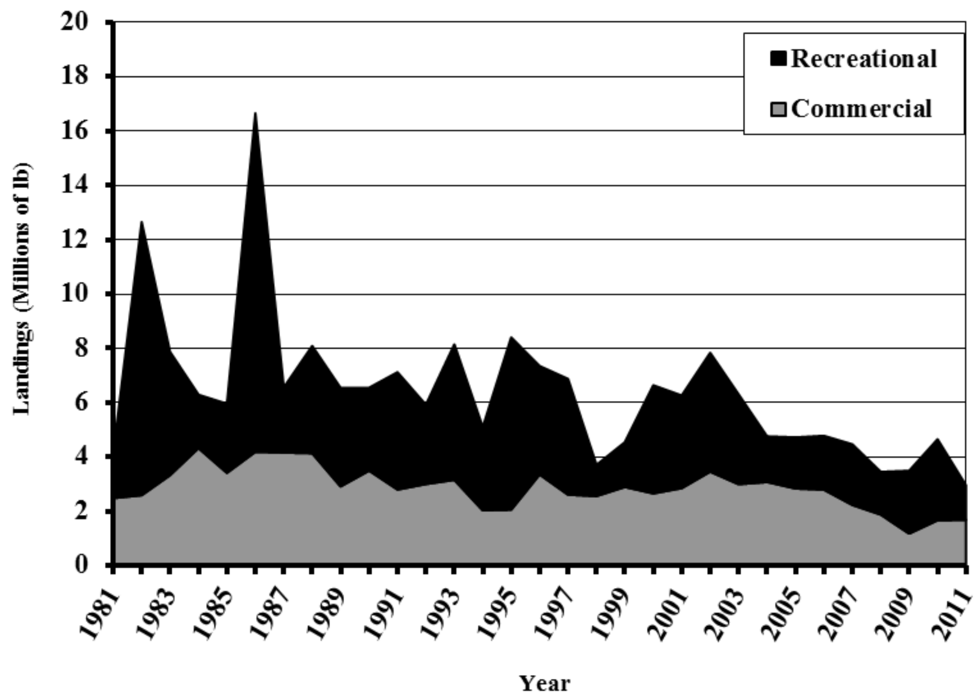

Figure 3. Commercial and Recreational U.S. Black Sea Bass Landings (Pounds) from Maine-North Carolina, 1981-2011.

Table 1 summarizes the black sea bass management measures for the 2003-2012 fishing years. Acceptable biological catch (ABC) levels have been identified for this stock since 2010, and recreational and commercial annual catch limits (ACLs), with a system of overage accountability for each ACL, were first implemented in 2012. It should be noted that catch limits include both projected landings and discards, whereas the commercial quotas and recreational harvest limits are landings based (i.e., harvest).

Table 1. Summary of management measures and landings for 2003 through 2012.

Management measures	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
ABC (m lb)	NA	NA	NA	NA	NA	NA	NA	4.500	4.500	4.500
TAC (m lb)	NA	NA	NA	NA	NA	NA	2.300	4.500	4.500	4.500
Commercial ACL	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.980
Com. quota–adjusted (m lb)[a]	3.012	3.768	3.950	3.832	2.377	2.026	1.093	1.759	1.711	1.710
Commercial landings	3.000	3.082	2.844	2.802	2.240	1.883	1.182	1.676	1.689	NA
Recreational ACL	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.860
Rec. harvest limit-adjusted (m lb)[a]	4.434	4.01	4.13	3.989	2.474	2.108	1.138	1.830	1.781	1.320
Recreational landings	3.304	1.679	1.878	1.979	2.229	1.571	2.313	2.979	1.267	NA
Com. fish size (in)	11	11	11	11	11	11	11	11	11	11
Com. min. mesh size (in, diamond)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Threshold (lb)	500/100	500/100	500/100	500/100	500/100	500/100	500/100	500/100	500/100	500/100
Vent size (in)	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8
Recreational measures (minimum fish size (total length), possession limit, and open season)	12-in TL, 25 fish, 1/1-9/1 and 9/16-11/30	12-in TL, 25 fish, 1/1-9/7 and 9/22-11/30	12-in TL, 25 fish, 1/1-12/31	12-in TL, 25 fish, 1/1-12/31	12-in TL, 25 fish, 1/1-12/31	12-in TL, 25 fish, 1/1-12/31	12.5-in TL, 25 fish, 1/1-10/5	12.5-in TL, 25 fish, 5/22-10/11 and 11/1-12/31	12.5-in TL, 25 fish, 5/22-10/11 and 11/1-12/31	12.5-in TL, 25 fish, 5/19-10/14 and 11/1-12/31

[a]Adjusted for RSA and projected discards. NA=Not applicable or not yet available.

The ASMFC divides the commercial quota among the states based on the allocation percentages given in Table 2, and states set measures to achieve their state-specific commercial quotas.

Table 2. The ASMFC black sea bass allocation formula for the commercial fisheries in each state.

State	Allocation (percent)
ME	0.5
NH	0.5
MA	13.0
RI	11.0
CT	1.0
NY	7.0
NJ	20.0
DE	5.0
MD	11.0
VA	20.0
NC	11.0
Totals	100

NMFS statistical areas are shown in Figure 4. VTR data suggest that statistical area 622 was responsible for the majority of the catch, with statistical area 616, which includes Hudson canyon, having the majority of trips that caught black sea bass (Table 3).

Table 3. Statistical areas that accounted for at least 5 percent of the black sea bass catch in 2011, NMFS VTR data.

Statistical Area	Black Sea Bass Catch (percent)	Black Sea Bass Trips (N)
622	19.74	222
621	17.66	330
616	13.60	486
615	7.15	188

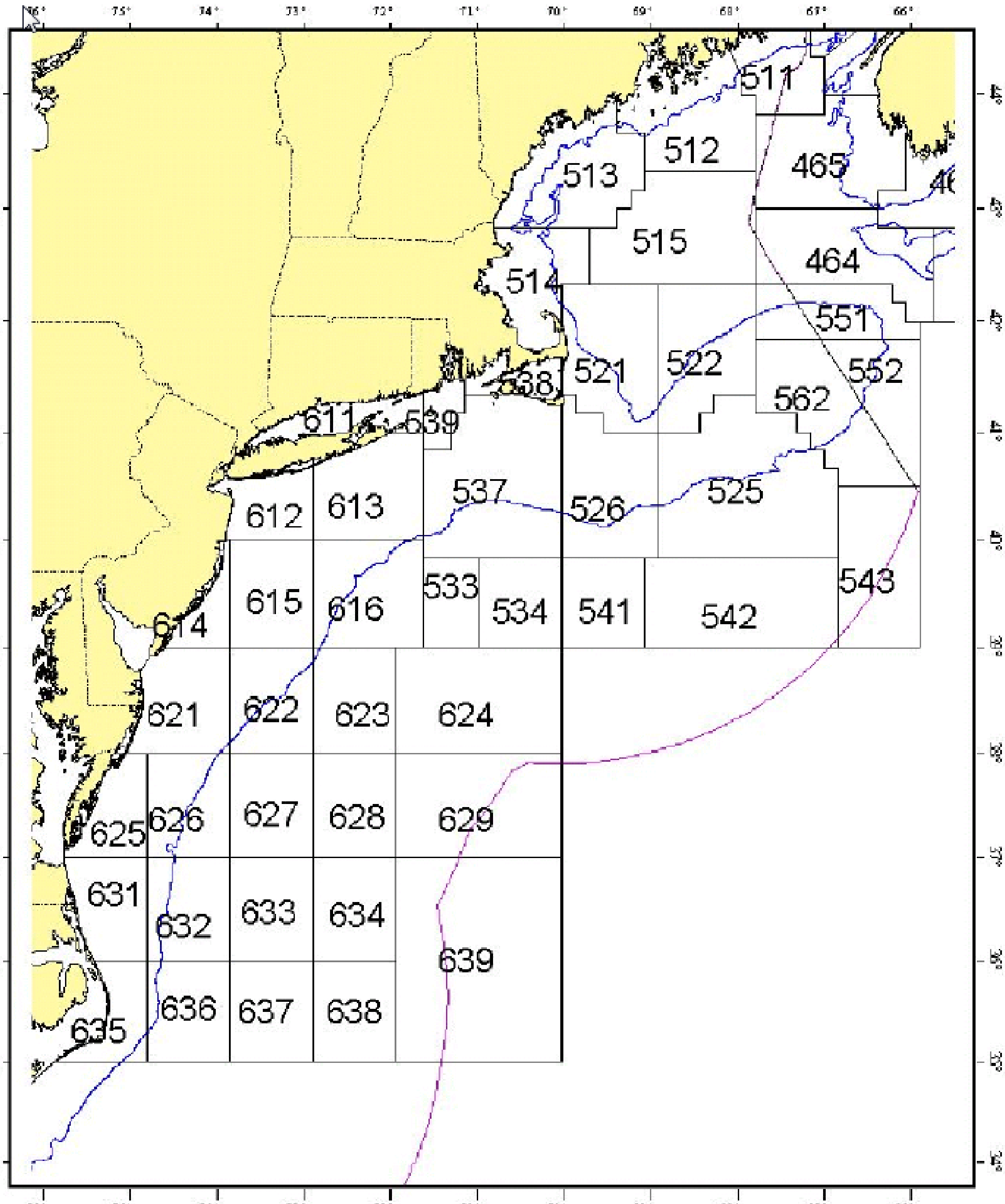

Figure 4. NMFS Statistical Areas.

Based on VTR data for 2011, the majority of black sea bass landings were taken by bottom otter trawls (55 percent), followed by pots and traps (35 percent), hand lines (6 percent), and offshore lobster pots and traps (< 3 percent). Other gear types each accounted for less than 1 percent of landings. Current regulations state that large trawl nets are required to possess a minimum of 75 meshes of 4.5 inch diamond mesh in the codend, or the entire net must have a minimum mesh size of 4.5 inch throughout (Table 1). The threshold level used to trigger the minimum mesh requirement size is 500 lb from January through March and 100 lb from April through December (Table 1). In addition, the minimum circle vent size requirements for black sea bass pots/traps are 2 1/2 inch, 1 3/8 inch x 5 3/4 inch for rectangular vents, and 2 inch for square vents. Two vents are required in the parlor portion of the pot/trap.

Black sea bass ex-vessel revenues based on dealer data have ranged from $2.2 to $7.8 million for the 1994 through 2011 period. The mean price for black sea bass (unadjusted) has ranged from a low of $1.14/lb in 1996 to a high of $3.20/lb in 2011 (Figure 5). In 2011, 1.7 million pounds of black sea bass were landed generating $5.4 million in revenues ($3.20/lb).

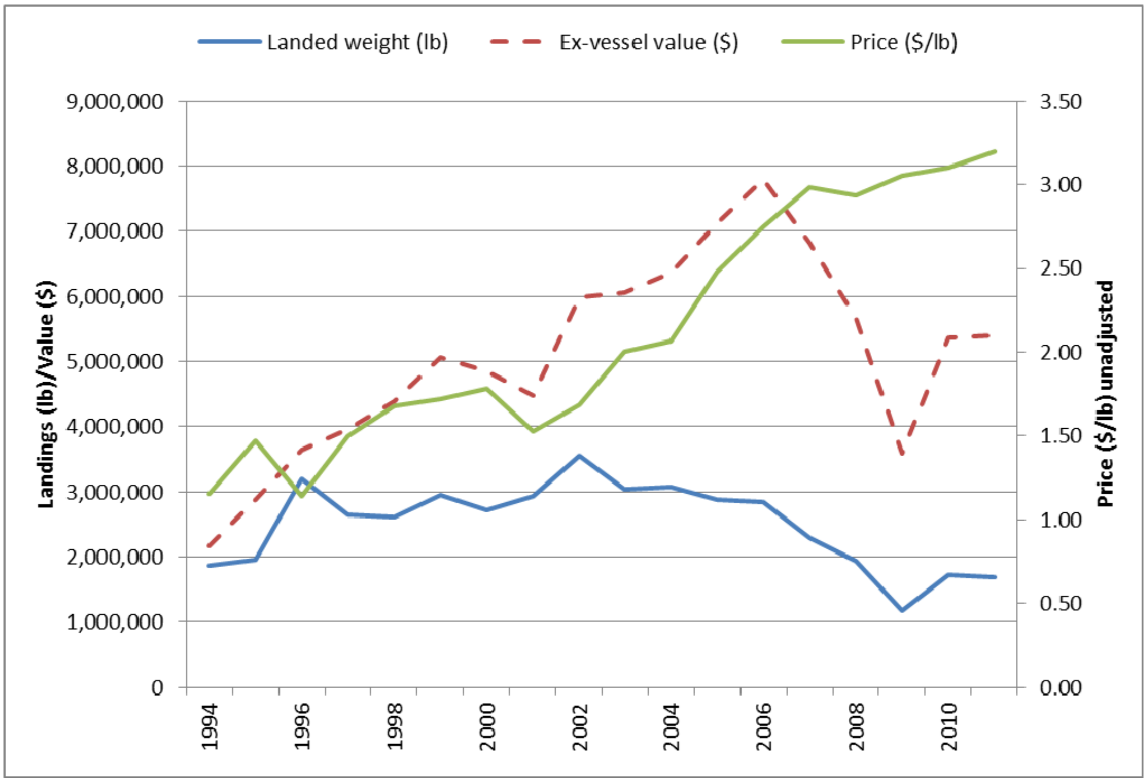

Figure 5. Landings, ex-vessel value, and price (unadjusted) for black sea bass, Maine through North Carolina, 1994-2011.

The ports and communities that are dependent on black sea bass are fully described in Amendment 13 to the FMP. Additional information on "Community Profiles for the Northeast US Fisheries" can be found at
http://www.nefsc.noaa.gov/read/socialsci/community_profiles/

To examine recent landings patterns among ports, 2011 NMFS dealer data are used. The top commercial landings ports for black sea bass by pounds landed are shown in Table 4. A "top port" is defined as any port that landed at least 100,000 lb of black sea bass.

Related data for the recreational fisheries are shown in subsequent sections. However, due to the nature of the recreational database, it is inappropriate to desegregate to less than state levels.

Table 4. Top ports of landing (in lb) for black sea bass (BSB), based on NMFS 2011 dealer data. Since this table includes only the "top ports," it may not include all of the landings for the year. Note: C = Confidential

Port	Landings of BSB (lb)	# BSB Vessels
OCEAN CITY, MD	166,959	14
PT. JUDITH, RI	157,016	124
PT. PLEASANT, NJ	138,062	33
CAPE MAY, NJ	115,896	40
HAMPTON, VA	109,348	30

Among the states from Maine through North Carolina, New York had the highest number of Federally permitted dealers (45) who bought black sea bass in 2011 (Table 5). All dealers bought approximately $5.4 million of black sea bass in 2011.

Table 5. Dealers reporting buying black sea bass, by state in 2011.

	MA	RI	CT	NY	NJ	DE	MD	VA	NC	Other
Number of Dealers	30	32	11	45	25	3	5	15	20	2

Recreational Fishery

There is a significant recreational fishery for black sea bass in state waters, which occurs seasonally when the fish migrate inshore during the warm summer months. In Federal waters, the recreational black sea bass fishery is managed on a coastwide basis. State waters are also managed on a coastwide basis, with the exception of the last two years (i.e., 2011, 2012) when an ASMFC Addendum was developed to enable state-specific measures to be implemented. The 2012 recreational fishing measures in Federal waters are given in Table 1, and the 2012 state-specific measures are given in Table 6.

Table 6. Black sea bass recreational fishing measures in 2012, by state.

State	Minimum Size (inches)	Possession Limit	Open Season
Massachusetts	14	10 fish	May11-June 24
		20 fish	June 25-October 31
Rhode Island	13	15 fish	June 15-December 31
Connecticut	13	15 fish	June 15-December 31
New York	13	15 fish	June 15-December 31
New Jersey	12.5	25 fish	May 19- September 3, September 23-October 14, and November 1-December 31
Delaware	12.5	25 fish	May 22 to October 14 and November 1 to December 31
Maryland	12.5	25 fish	May 22 to October 14 and November 1 to December 31
PRFC	12.5	25 fish	May 19 to October 14 and November 1 to December 31
Virginia	12.5	25 fish	May 19 to October 14 and November 1 to December 31
North Carolina (North of Cape Hatteras 35° 15'N Latitude)	12.5	25 fish	May 19 to October 14 and November 1 to December 31

Recreational data are available through the Marine Recreational Fishery Statistics Survey (MRFSS, 1981-2003), with recent years' estimates revised under the Marine Recreational Information Program (MRIP, 2004-2011). Recreational catch and landings peaked in 1986 with landings in numbers and weight at the lowest levels in 2011 (Table 7). When anglers are intercepted through the surveys conducted for the recreational statistics programs, they are asked about where the majority of their fish were caught (i.e., inland, state waters (<=3 miles), exclusive economic zone (EEZ; > 3 miles)). While these data are somewhat imprecise, they do provide a general indication of where the majority of black sea bass are landed recreationally, and indicate that a majority of the landings are now occurring in state waters (Table 8). The states of Massachusetts, New Jersey, and New York land the majority of fish (Table 9).

Table 7. Recreational black sea bass landings data from the NMFS recreational statistics databases, 1981-2011.

Year	Catch ('000 of fish)	Landings ('000 of fish)	Landings ('000 lb)
1981	5,301	2,734	1,628
1982	11,615	10,249	10,054
1983	8,707	5,631	4,530
1984	4,330	2,491	1,961
1985	7,131	4,216	2,540
1986	29,167	21,904	12,461
1987	5,912	3,467	2,392
1988	9,363	4,060	3,945
1989	7,000	4,649	3,621
1990	9,622	4,269	3,047
1991	11,224	5,458	4,316
1992	8,296	3,869	2,914
1993	9,451	6,197	4,985
1994	7,688	3,571	3,054
1995	14,481	6,887	6,339
1996	8,437	3,764	4,125
1997	11,088	4,868	4,399
1998	5,699	1,259	1,290
1999	7,758	1,412	1,697
2000	17,667	3,755	4,122
2001	14,626	3,006	3,596
2002	15,080	3,421	4,442
2003	12,649	3,392	3,449
2004	8,884	1,925	2,307
2005	8,358	1,489	2,188
2006	8,729	1,392	1,886
2007	9,601	1,630	2,347
2008	11,102	1,342	2,094
2009	9,875	1,909	2,595
2010	11,133	2,335	3,286
2011	5,794	881	1,267

Table 8. Percentage of black sea bass recreational landings (MRIP Type A+B1 in number of fish) by year and area, Maine through North Carolina, 2002-2011. Area information is self-reported based on the area where the majority of fishing activity occurred per angler trip.

	Black sea bass	
Year	**State <= 3 mi**	**EEZ > 3 mi**
2002	21.5	78.5
2003	22.1	77.9
2004	25.6	74.4
2005	29.9	70.1
2006	34.9	65.1
2007	34.8	65.2
2008	60.3	39.7
2009	67.5	32.5
2010	72.1	27.9
2011	63.8	36.2
Avg. 2002-2011	39.7	60.3
Avg. 2009- 2011	67.8	32.2

Table 9. State contribution (as a percentage) to total recreational landings of black sea bass, (MRIP Type A+B1 in number of fish), from Maine through North Carolina, 2010 and 2011.

State	2010	2011
Maine	0.0	0.0
New Hampshire	0.0	0.0
Massachusetts	30.1	22.1
Rhode Island	6.9	5.7
Connecticut	0.7	1.0
New York	23.3	31.2
New Jersey	29.4	16.9
Delaware	0.9	4.9
Maryland	1.5	5.4
Virginia	1.3	2.2
North Carolina	6.0	10.8
Total	**100%**	**100%**

In 2011, there were 819 recreational vessels (i.e., party and charter vessels) that held black sea bass Federal recreational permits. Many of these vessels also hold recreational permits for summer flounder and scup. Landings by mode indicate that party/charter fishermen are responsible for the majority of black sea bass landings (Table 10).

Table 10. The number of black sea bass landed from Maine through North Carolina by mode, 1981-2011.

		Mode	
Year	**Shore**	**Party/Charter**	**Private/Rental**
1981	452,101	1,440,171	841,480
1982	81,445	8,104,204	2,063,332
1983	222,011	4,005,707	1,403,508
1984	98,228	1,128,294	1,264,894
1985	163,447	2,393,048	1,659,703
1986	1,021,524	16,695,386	4,187,088
1987	71,956	1,157,244	2,238,164
1988	140,754	1,691,300	2,227,901
1989	237,968	1,991,670	2,419,649
1990	289,379	2,268,914	1,710,458
1991	250,675	2,586,149	2,621,274
1992	45,368	2,043,188	1,780,226
1993	54,675	4,579,665	1,562,229
1994	243,347	2,005,887	1,321,627
1995	275,982	5,197,229	1,413,571
1996	70,522	2,631,735	1,062,026
1997	8,337	3,950,335	908,840
1998	7,073	777,874	474,071
1999	19,231	621,355	771,259
2000	177,489	1,797,695	1,780,239
2001	14,034	1,826,851	1,164,977
2002	16,618	2,066,232	1,338,447
2003	10,760	2,073,130	1,308,496
2004	9,462	698,456	1,217,163
2005	13,110	605,934	869,466
2006	49,081	730,749	612,622
2007	9,865	909,873	709,905
2008	9,447	479,680	852,622
2009	23,992	442,106	1,442,842
2010	6,096	519,527	1,809,044
2011	8,177	310,764	561,727
% of total, 1981 - 2011	3%	61%	36%
% of total, 2007 - 2011	1%	33%	66%

The NMFS angler expenditure survey summarizes a variety of costs associated with recreational fishing in the Northeast (Table 11). In addition, Steinback et al., 2009 summarized the reasons for fishing, with a majority of anglers (about 85 percent) fishing either mostly or fully for recreational purposes (Table 12).

Table 11. Average daily trip expenditures ($ unadjusted) by recreational fishermen in the Northeast region by mode, in 2006. Source: Gentner and Steinback (2008)

Expenditures	$		
	Party/Charter	Private/Rental	Shore
Private transportation	13.88	11.03	12.94
Public transportation	0.26	0.07	0.40
Auto rental	0.27	0.02	0.10
Food from grocery stores	7.40	4.92	7.33
Food from restaurants	8.70	3.42	9.28
Lodging	10.0	2.64	14.90
Boat fuel	0	9.54	0
Boat or equipment rental	0.05	0.19	0.03
Charter fees	57.76	0	0
Charter crew tips	3.0	0	0
Catch processing	0.02	0	0
Access and parking	0.44	1.11	1.32
Bait	0.31	3.42	3.25
Ice	0.39	0.59	0.39
Tackle used on trip	1.87	2.04	3.98
Tournament fees	1.10	0.04	0.02
Gifts and souvenirs	1.67	0.10	1.45
Total	107.13	39.14	55.39

Table 12. Purpose of Marine Recreational Fishing in the Northeast.

	Percent	**Number of anglers in 2005 (thousands)**
Purpose of recreational fishing trips		
All for food or income	2.1	92.4
Mostly for food or income	<1.0	34.3
Both for recreation and for food or income	11.7	514.8
Mostly for recreation	13.2	580.8
All for recreation	72.2	3,176.8

Source: Steinback et al., 2009.

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Black Sea Bass Assessment Summary for 2012

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Introduction

An age-based assessment of black sea bass was reviewed at SAW 53 in December 2011 (NEFSC 2012). Although the age-based model was not accepted by reviewers, several recommended data changes were found to be appropriate. In this 2012 update (with projections for 2013), the new information will be incorporated into the length-based model (SCALE) used in previous updates. In addition, attempts were made to characterize the uncertainty in the catch projections and updated biological reference points.

SCALE Model Input

The updated stock assessment of the northern stock of black sea bass requires both fisheries dependent and independent information. Indices of abundance and associated length distributions were NEFSC spring and winter bottom trawl surveys in offshore strata. Previous assessments used the stratified $\log_e$ re-transformed stratified mean number per tow, however the arithmetic stratified mean numbers per tow were considered more appropriate by SAW53 reviewers. The vessel used in the NEFSC surveys changed from the Albatross IV to the Bigelow in 2009. The Bigelow catch was standardized to Albatross units using calibration coefficients at length (Miller et al. 2010). The winter survey series was terminated before the Bigelow came into service and therefore did not require calibration. Indices of adult abundance were defined as fish >=22 cm whereas juvenile indices were sea bass<= 14 cm. Mean lengths at age were predicted from a growth curve derived from NEFSC age information (NEFSC 2012) and length-weight equation parameters were from fitted length weight data collected on NEFSC surveys.

Total catch included commercial landings since 1968, commercial discard estimates since 1989, and recreational landings and discards since 1981. Recreational catch from 1968 to 1980 estimates was derived from a ratio with commercial inshore fishery landings. The recreational data since 2004 was been recalculated to account for differential site selection weights and provided as MRIP data. The MRFSS data prior to 2004 was converted to MRIP standards based on a linear relationship between the two data sets (MRIP # = 0.9315(MRFSS#) + 239,182). A release mortality of 15% (approved at

SAW53) was applied to recreational discards (B2) rather than the 25% used in previous updates.

The model was allowed to fit survey length frequencies greater than 22 cm. Selectivity periods were chosen based on regulatory changes in the fisheries. The three periods were 1968 to 1997, 1998 to 2000 and 2001 to 2011. The model was fit with a constant natural mortality of 0.4. Model output included total biomass, fishing mortality and population number at length which were in turn used to calculate annual estimates of spawning stock biomass (based on a length–weight equation and maturity at length from NEFSC survey results).

Additional changes used to improve model diagnostics include increased effective sample sizes for spring indices and catch, and increased weighting of the objective function for spring recruitment and adult indices.

SCALE Model results

The length-based SCALE model continued to serve as the basis for the black sea bass assessment. The use of the arithmetic mean indices improved the fit (Figure 8) compared to previous model configurations. Estimated fishing mortality declined steadily from a peak in 2001 of 1.29. The 2011 F_{mult} value was 0.21 (1 std dev = 0.029) which was a decrease from a 2010 estimate of 0.34 (1 std dev = 0.047). Total biomass in 2011 was estimated at 12,700 mt, a decline from the 2010 estimate of 13,165 mt. SSB followed a similar pattern with 2011 SSB of 11,145 mt, decreasing from 11,653 mt in 2010. Recruitment estimated by the model was relatively constant through the time series with the exception of the 1975, 1999 and 2001 year classes. Recruitment has been at or below average since 2002 with the estimated average recruitment (age 1) in 2011 (2010 cohort) at 21.0 million fish (1 std dev = 4.135 million).

Biological Reference Points

Changes to the input data (15% B2 mortality, arithmetic mean indices, MRIP data and a modified growth curve using new age data) required an update to the biological reference points. A length-based yield per recruit model, using both stochastic and deterministic approaches, was updated to remain compatible with the assessment model results. SSB_{MSY} and B_{MSY} were calculated from biomass and SSB per recruit at $F_{40\%}$ (a proxy for F_{MSY}) and the average of age 1 recruitment in the 1968-2011 series.

The 2011 F_{mult} = 0.21 ($\pm$ 2 std = 0.155 to 0.269) was below F_{MSY} (F40% proxy) = 0.44 and the 80% CI of 0.361 to 0.533. Total biomass in 2011 (12,700 mt) exceeded the deterministic B_{MSY} (12,495 mt) but was slightly lower than the stochastic value of 12,978 mt (approx 80% CI of 9,469 to 16,857). Total biomass in 2010 (13,165 mt) was also above B_{MSY}. SSB followed a similar pattern, with 2011 SSB (11,145 mt) above the deterministic value of SSB_{MSY} (10,880 mt) but below the stochastic SSB_{MSY} average value of 11,300 mt (80% CI of 8,245 to 14,677).

Projections

Deterministic projections for black sea bass were made using the SCALE model. Final values for catch and population numbers through 2011 were input as fixed values in the SCALE input and catch for 2012 was assumed equal to the 2012 acceptable biological catch (ABC = 2,041 mt). Length composition in 2012 was set equal to 2011 and assumed constant through 2013. Fishing mortality in 2012 was calculated by iterating across possible F values until the model predicted catch equivalent to the assumed 2012 catch. Projections for 2013 were completed by specifying fishing mortality, such as F_{MSY}, and allowing the model to predict the associated catch. The allocation of catch into discards and landings was assumed equal to the 2009 to 2011 average ratios (83% landings, 17% discards).

Under the current TAC, 2012 predicted fishing mortality was calculated as 0.27. The subsequent catch in 2013 with an equivalent fishing mortality (0.27) would result in an expected total catch of 2,070 mt and landings of 1,721 mt. Increasing fishing mortality to F_{MSY} (0.44) would result in 2013 catch estimate of 3,175 mt with landings of 2,639 mt, while 75% of F_{MSY} (0.33), would project to a 2013 catch of 2,494 mt or landings of 2,072 mt. A similar projection fixing the catch at the 2011 TAC would project to a 2013 fishing mortality of 0.19 and a 2014 biomass of 15,047 mt. Jan 1, 2014 total biomass and SSB associated with each scenario are presented in Table 3.

Stochastic projections were also done using a Monte Carlo re-sampling of fishing mortalities, terminal year stock size and recruitment. Results from the SCALE model were output as stock sizes at age, converted from length using the growth curve. The terminal year N at age and standard deviations were used to develop a distribution of 1000 values per age (assuming a normal distribution). Five thousand recruitment values were generated as a log normal distribution from the average and standard deviation of the 1968-2011 time series. A distribution of 1000 fishing mortalities was generated from the stochastic length based YPR output of $F_{40\%}$ and associated std. dev. Similarly, F_{2011} and the associated std. dev were used to generate a distribution of possible values for F status quo scenarios. Values from the recruitment, stock size and F distributions were randomly selected and the vector of stock abundance at age projected through 2014. Associated biomass, SSB and catch were calculated using average weight at age and maturity at age. The results of projected catch and SSB estimates are provided in Table 4 and Figures 16 and 17.

Median catch estimates for 2013 under F_{MSY} would equal 3,166 mt (80% CI 2,459-3,928 mt). Continuation at a fishing mortality equivalent to 2011 would produce a median catch of 1,641 mt (80% CI 1,285-2,050 mt). In both extremes the median total biomass (Jan 1, 2014) would remain above B_{MSY}.

Conclusion

The conclusion from the black sea bass assessment update through 2011 is that the stock is not overfished and overfishing is not occurring. Total biomass and spawning biomass are near B_{MSY} and SSB_{MSY} respectively (slightly above or below point estimates depending on use of a deterministic or stochastic reference point value). The revised model reduces the uncertainty seen in previous updates between observed and predicted spring survey indices.

Although the overall stock complex is at or above the target reference points, local conditions may vary. Examination of recreational CPUE (catch per angler per trip) from self-reported party/charter boat logs shows a downward trend in overall CPUE (Figure 18). Within total catch, discards are increasing whereas landed fish are decreasing. Local trends vary with a decline in the New York-New Jersey areas but an increase in the MA-RI catch rate. (Figure 19). The rate for Delaware and south is more variable but has most recently increased.

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Table 1. Black sea bass catch (mt), 1968-2011, for stock north of Cape Hatteras, NC. MRIP catch used in analysis. Data in red based on extrapolation.

MT Year	Commercial Landings	Recreational MRFSS Landings	Recreational MRIP Landings	Commercial Discard Loss	Recreational Discard loss (MRFSS)	Recreational Discard loss (MRIP)	Total w/ MRIP	Total w/ MRFSS
1968	1,079	*1,108*	1,144	64	*66*	66	*2,354*	2,318
1969	1,097	*1,127*	1,161	65	*67*	67	*2,391*	2,356
1970	970	*997*	1,038	58	*59*	60	*2,126*	2,084
1971	566	*581*	647	34	*35*	37	*1,284*	1,216
1972	727	*747*	803	43	*44*	46	*1,619*	1,562
1973	1,115	*1,145*	1,179	66	*68*	68	*2,429*	2,395
1974	1,023	*1,051*	1,090	61	*63*	63	*2,237*	2,198
1975	1,680	*1,726*	1,726	100	*103*	101	*3,607*	3,609
1976	1,557	*1,600*	1,607	93	*95*	94	*3,351*	3,345
1977	1,985	*2,039*	2,021	118	*121*	119	*4,243*	4,264
1978	1,662	*1,707*	1,708	99	*102*	100	*3,570*	3,570
1979	1,241	*1,275*	1,301	74	*76*	76	*2,692*	2,666
1980	977	*1,004*	1,045	58	*60*	60	*2,141*	2,099
1981	1,129	*558*	625	67	*33*	35	*1,857*	1,788
1982	1,177	*1,213*	1,243	70	*36*	40	*2,530*	2,729
1983	1,513	*1,869*	1,860	90	*111*	114	*3,577*	3,583
1984	1,519	*602*	666	105	*33*	36	*2,326*	2,258
1985	1,075	*958*	1,002	89	*44*	45	*2,210*	2,165
1986	1,508	*1,830*	1,824	101	*99*	95	*3,528*	3,537
1987	1,635	*880*	929	98	*34*	36	*2,698*	2,648
1988	1,424	*1,299*	1,324	102	*92*	90	*2,940*	2,917
1989	1,105	*1,488*	1,502	82	*38*	39	*2,727*	2,712
1990	1,402	*1,256*	1,283	53	*94*	92	*2,830*	2,805
1991	1,190	*1,885*	1,876	19	*94*	92	*3,176*	3,188
1992	1,264	*1,188*	1,219	91	*83*	82	*2,657*	2,627
1993	1,353	*2,194*	2,167	179	*63*	64	*3,762*	3,789
1994	848	*1,333*	1,355	34	*81*	80	*2,318*	2,296
1995	889	*2,815*	2,753	36	*129*	124	*3,802*	3,869
1996	1,448	*1,809*	1,804	483	*92*	91	*3,826*	3,832
1997	1,198	*1,932*	1,920	31	*115*	112	*3,261*	3,276
1998	1,171	*519*	588	136	*87*	86	*1,981*	1,913
1999	1,305	*746*	802	36	*115*	112	*2,255*	2,202
2000	1,205	*1,804*	1,800	42	*277*	263	*3,310*	3,329
2001	1,299	*1,545*	1,556	187	*309*	295	*3,336*	3,340
2002	1,587	*1,983*	1,968	24	*391*	372	*3,952*	3,985
2003	1,359	*1,498*	1,512	58	*314*	301	*3,230*	3,230
2004	1,405	*762*	817	370	*142*	140	*2,733*	2,679
2005	1,298	*851*	902	29	*150*	153	*2,383*	2,330
2006	1,285	*894*	945	16	*173*	166	*2,413*	2,372
2007	1,037	*1,010*	1,052	57	*220*	192	*2,338*	2,326
2008	875	*709*	771	37	*252*	242	*1,925*	1,877
2009	523	*1,047*	1,088	165	*228*	226	*2,002*	1,965
2010	751	*1,354*	1,373	110	*231*	251	*2,485*	2,444
2011	764	*493*	520	135	*146*	133	*1,553*	1,539

Table 2. Black sea bass updated biological reference points and 2011 F and biomass estimates.

	deterministic	stochastic	$\pm$ 80% CI
B_{MSY}	12,495 mt	12,978 mt	9,469 - 16,857
SSB_{MSY}	10,880 mt	11,300 mt	8,245 - 14,677
F_{MSY} ($F_{40\%}$)	0.44	0.44	0.361 - 0.533
MSY	3,284 mt	3,344 mt	2,782 - 3,931

2011 Total Biomass (mt)	12,700
2011 SSB (mt)	11,145
2011 SSB / SSB_{MSY}	99%
2011 F	0.21
2011 F / F_{MSY}	47.7%
2011 Yield (mt)	1,553

Table 3. Deterministic projections of black sea bass total catch (mt), landings (mt) and discards (mt) under five projection scenarios. 2012 catch assumed equal to quota. MSY= 3,284 mt, B_{MSY} = 12,495 mt, SSB_{MSY} = 10,880 mt. Landings proportion of catch based on 2009-2011 average of 83%.

	F	Catch (mt)	Landings (mt)	Discards (mt)	Total 2014 Biomass (mt)	2014 SSB (mt)
F_{2013}=F_{MSY}	0.44	3,175	2,639	540	13,268	9,684
F_{2013} = 75% F_{MSY}	0.33	2,494	2,072	424	14,002	10,383
$F_{status\ quo\ 2011}$	0.21	1,683	1,399	286	14,890	11,229
$F_{status\ quo\ 2012}$	0.27	2,070	1,721	352	14,434	10,795
$Catch_{status\ quo}$	0.19	1,553	1,291	264	15,047	11,379

Table 4. Stochastic projections of catch, and spawning biomass (mt) under four projection scenarios. 2012 catch assumed equal to quota. MSY=3,344 mt SSB_{MSY} = 11,300 mt, F_{MSY}=0.44, F_{2011}=0.21.

2013 Catch (mt)	Fmsy	75%Fmsy	50%Fmsy	F2011
average	3,187	2,470	1,752	1,658
median	3,166	2,444	1,735	1,641
lower 80%	2,459	1,866	1,314	1,285
upper 80%	3,928	3,110	2,210	2,050

2014 SSB (mt)	Fmsy	75%Fmsy	50%Fmsy	F2011
average	9,753	10,483	11,227	11,309
median	9,718	10,485	11,237	11,322
lower 80%	8,123	8,803	9,447	9,582
upper 80%	11,451	12,214	13,029	13,113

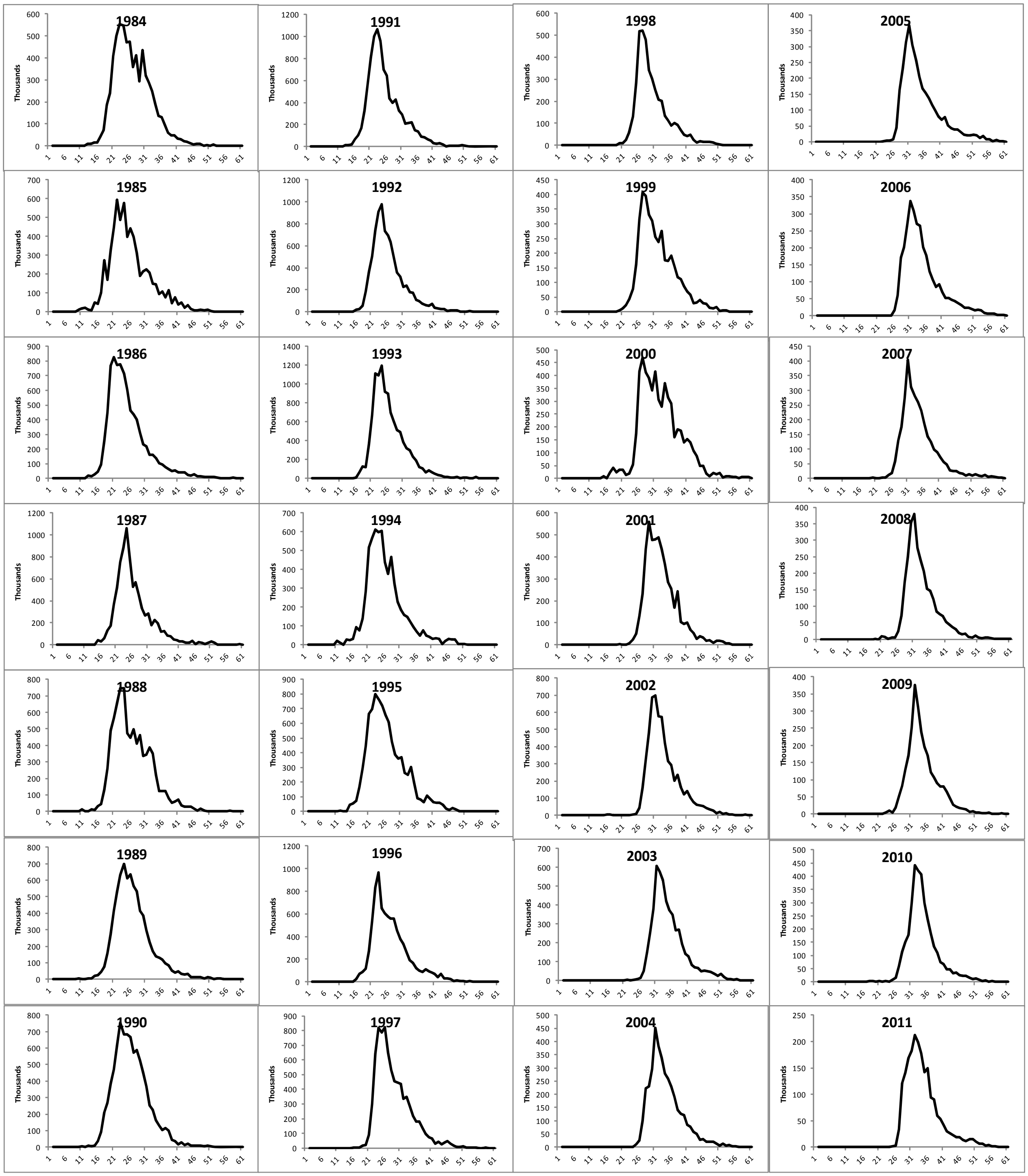


Figure 1. Black sea bass length frequencies from commercial and recreational landings, 1984-2011.

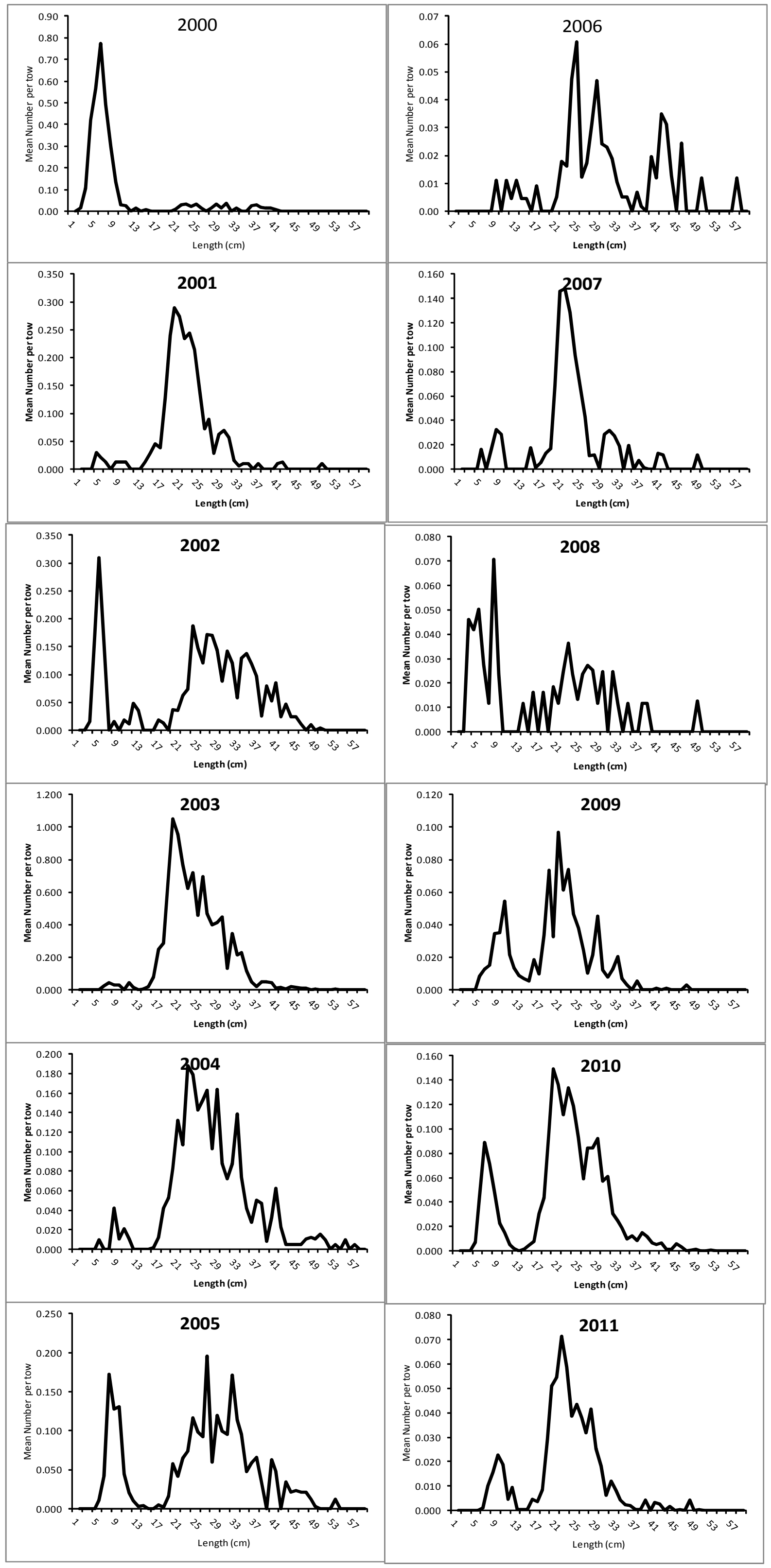


Figure 2. NEFSC spring offshore bottom trawl survey length frequencies (cm), 2000-2011.

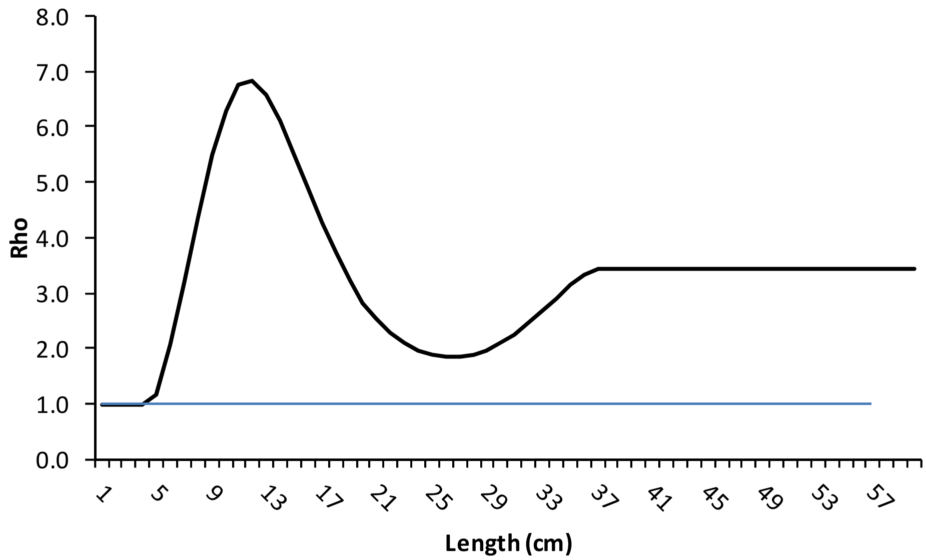


Figure 3. Calibration factor at length to convert black sea bass Bigelow number per tow into Albatross equivalents.

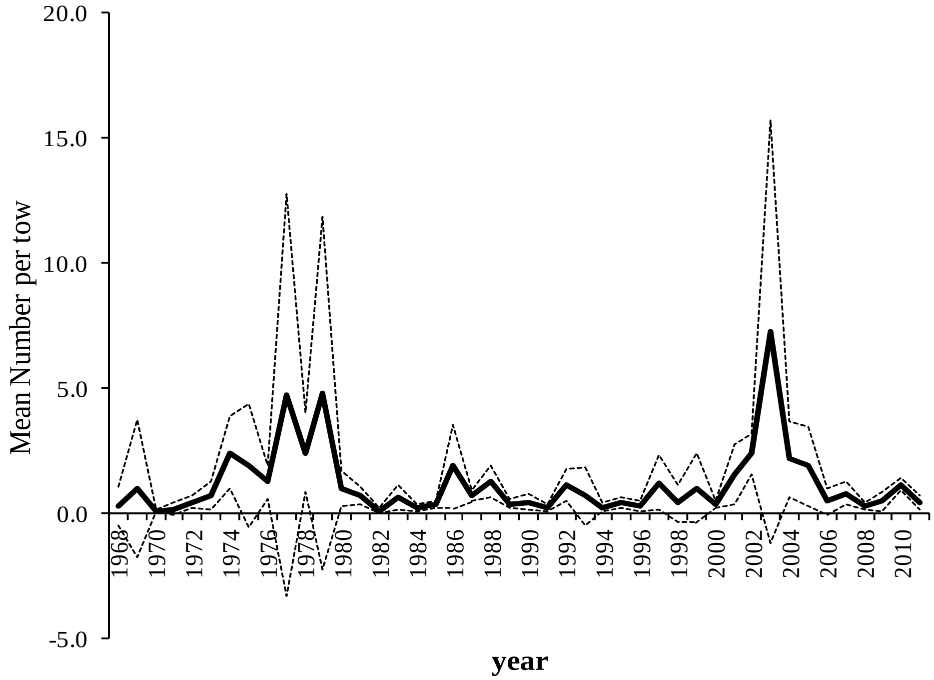


Figure 4. NEFSC spring offshore survey stratified mean number per tow (+ 95% CI) of black sea bass >22 cm. 2009-2011 indices converted from H. Bigelow to Albatross IV units with length specific rho values.

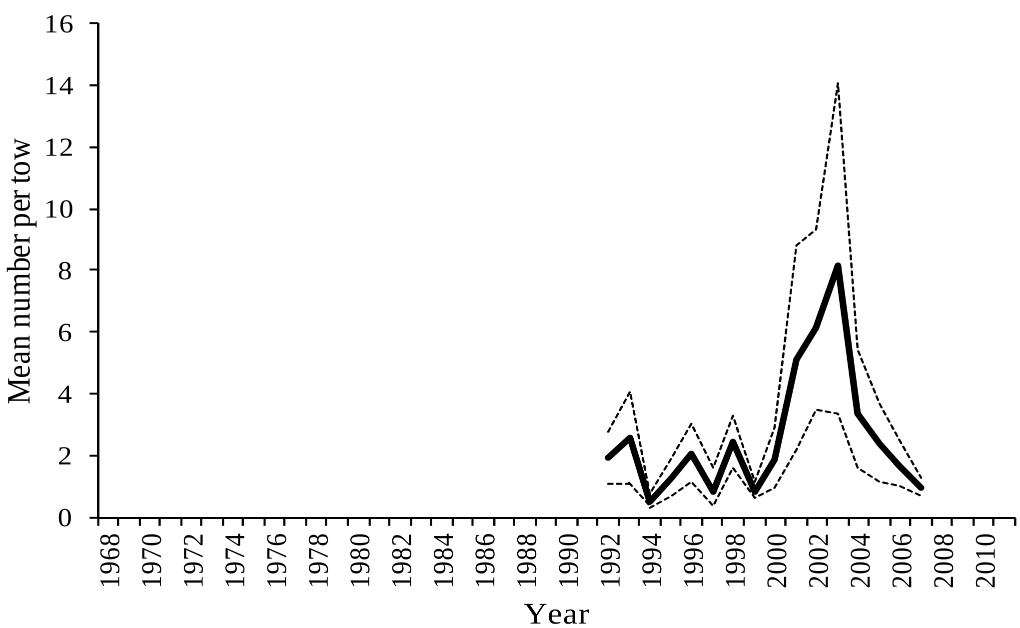


Figure 5. NEFSC winter offshore survey stratified mean number per tow (+ 95% CI) of black sea bass >22 cm.

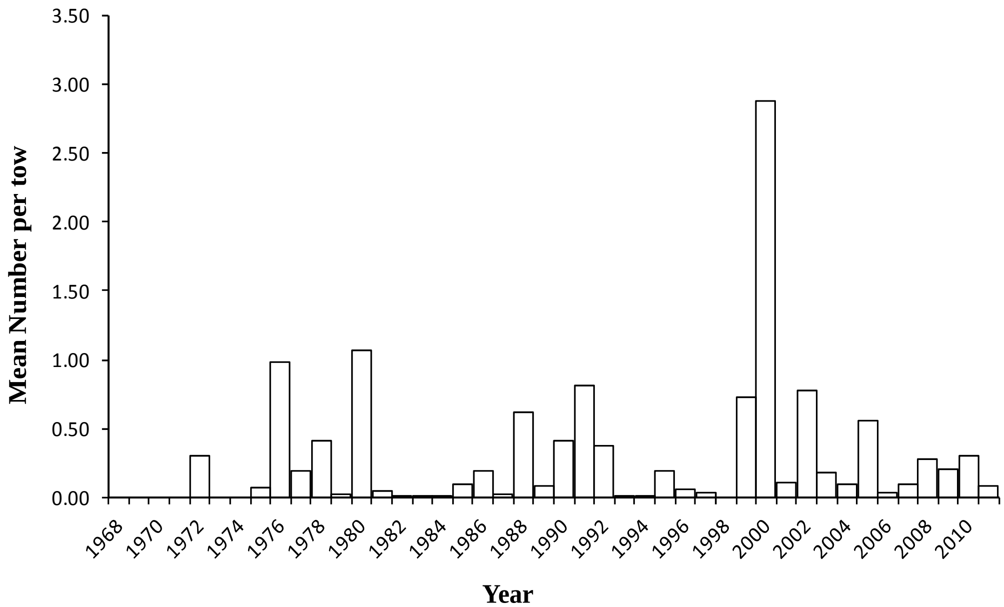


Figure 6. NEFSC spring offshore survey mean number per tow of black sea bass ≤ 14 cm, index of recruits. 2009-2011 indices converted from H. Bigelow to Albatross IV units with length specific rho value.

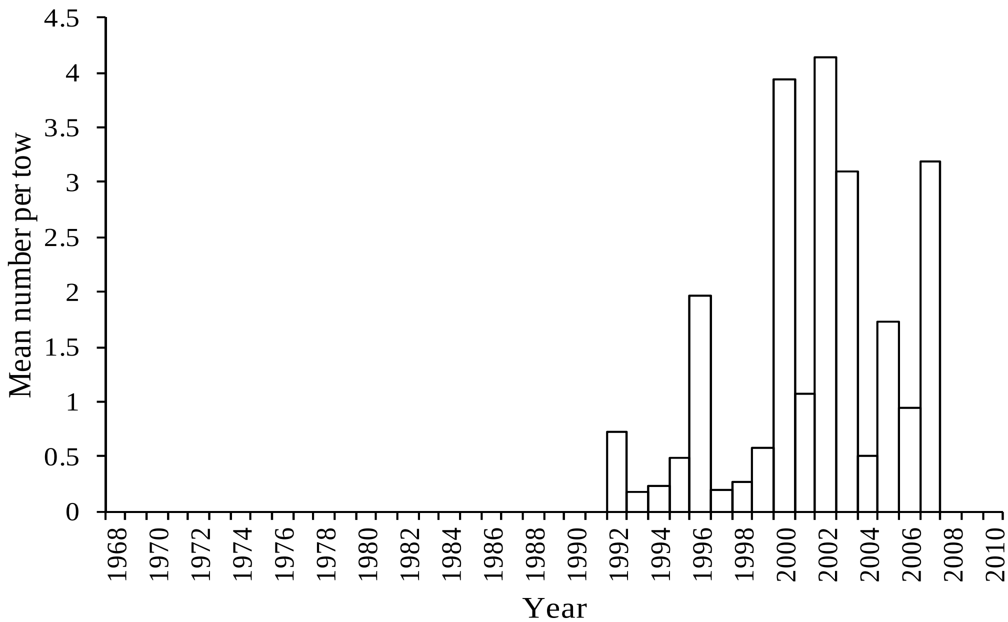


Figure 7. NEFSC winter offshore survey mean number per tow of black sea bass ≤ 14 cm, index of recruits.

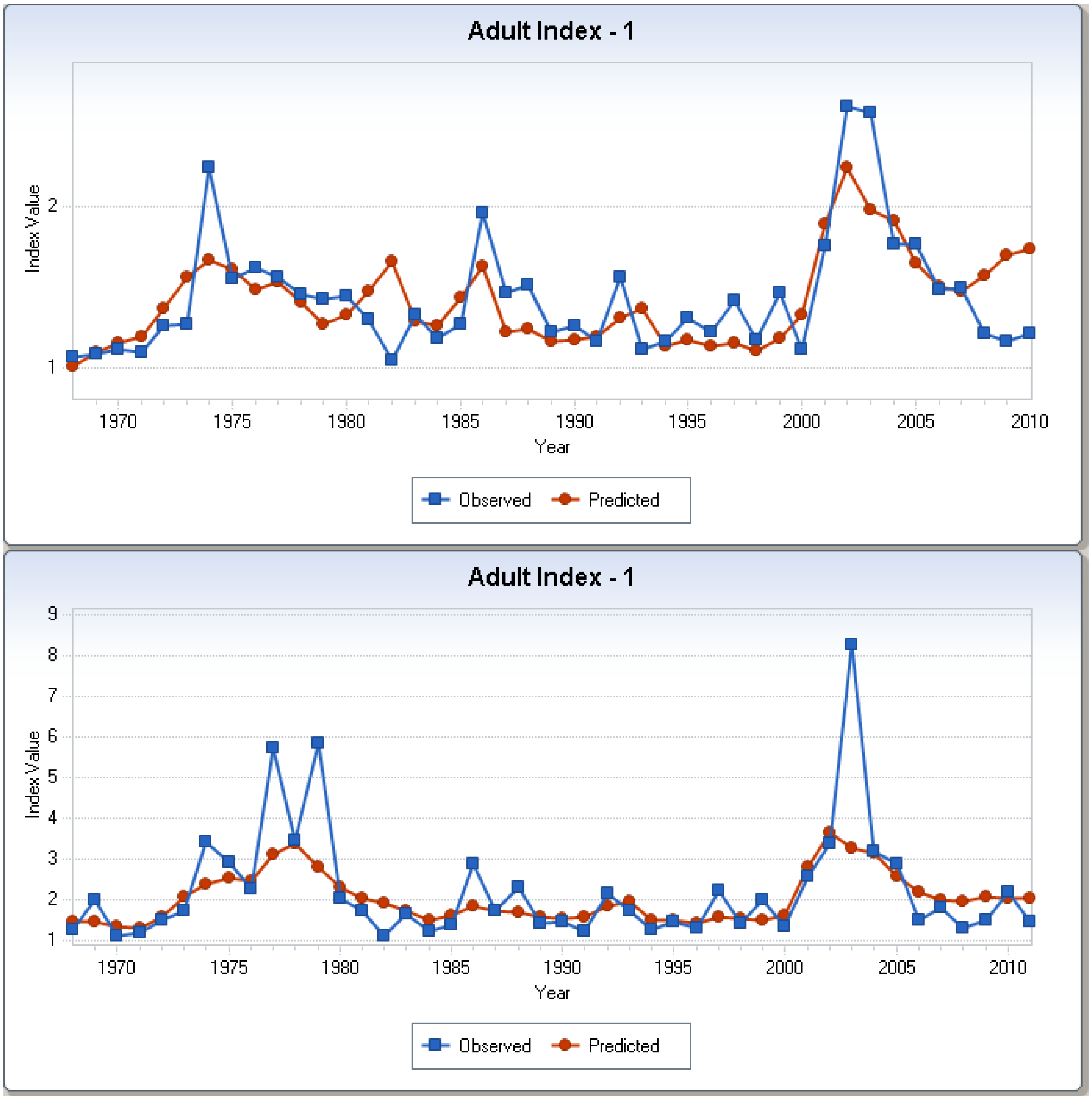
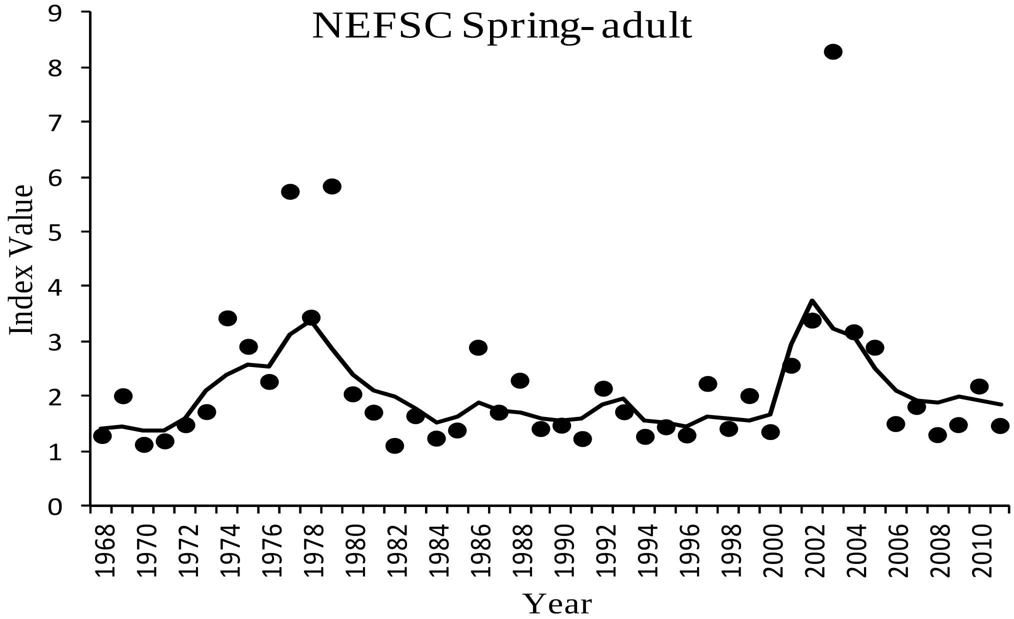


Figure 8. Comparison with Spring adult indices fit with ln-transformed indices from 2010 assessment (top graph) and arithmetic indices in 2011 assessment (bottom graph)



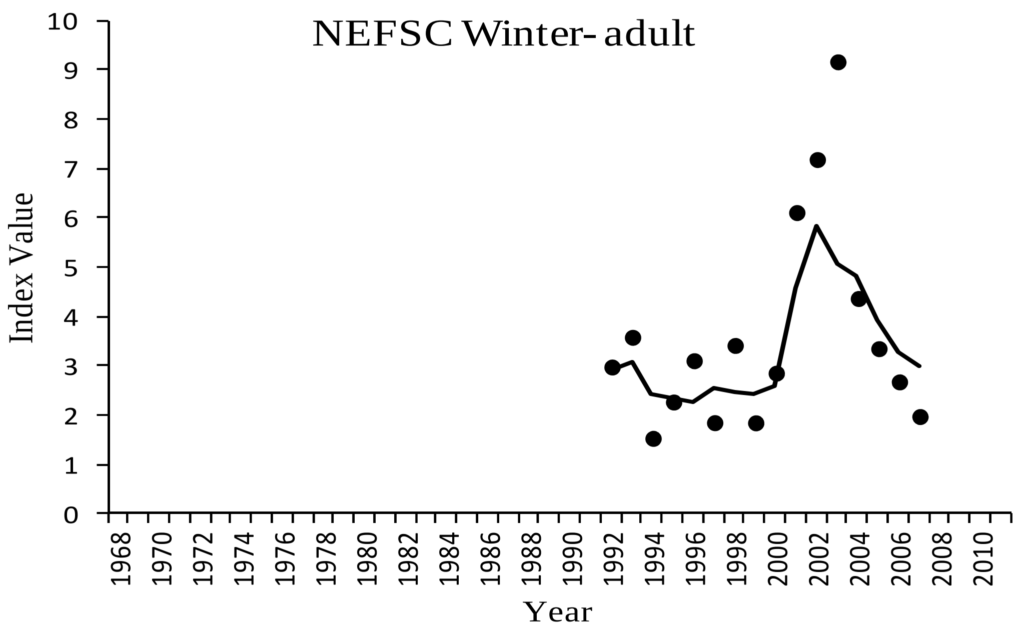
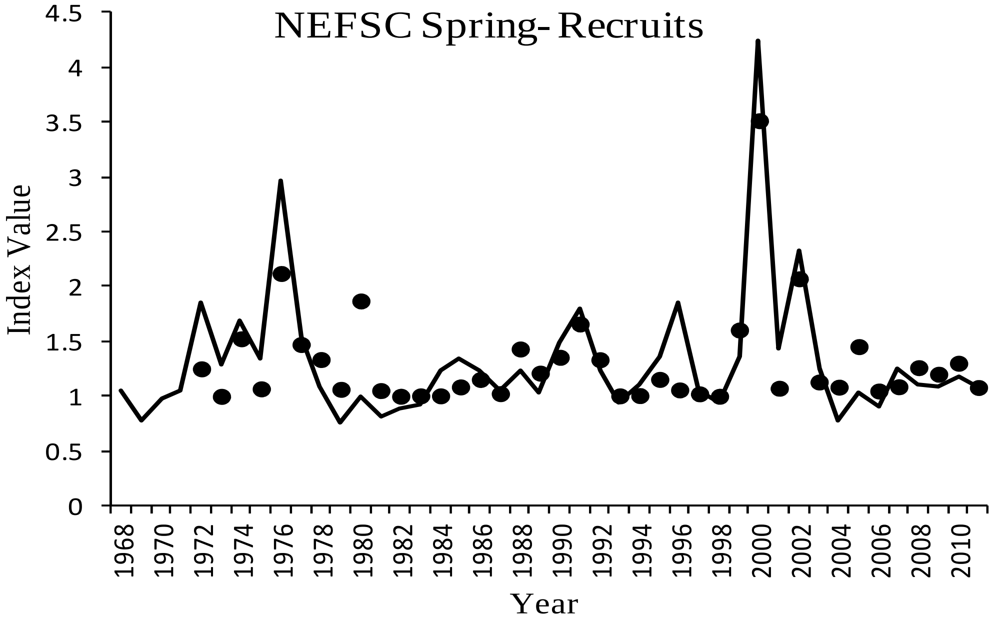


Figure 9. Observed and predicted black sea bass adult survey indices from SCALE model update 1968- 2011.



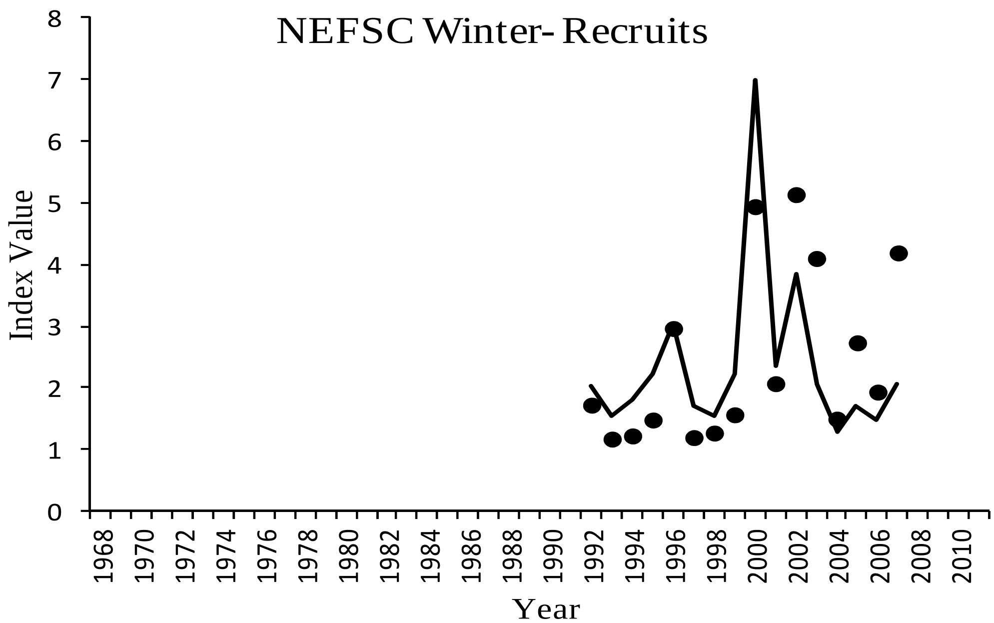


Figure 10. Observed and predicted black sea bass juvenile survey indices from SCALE model update 1968- 2011.

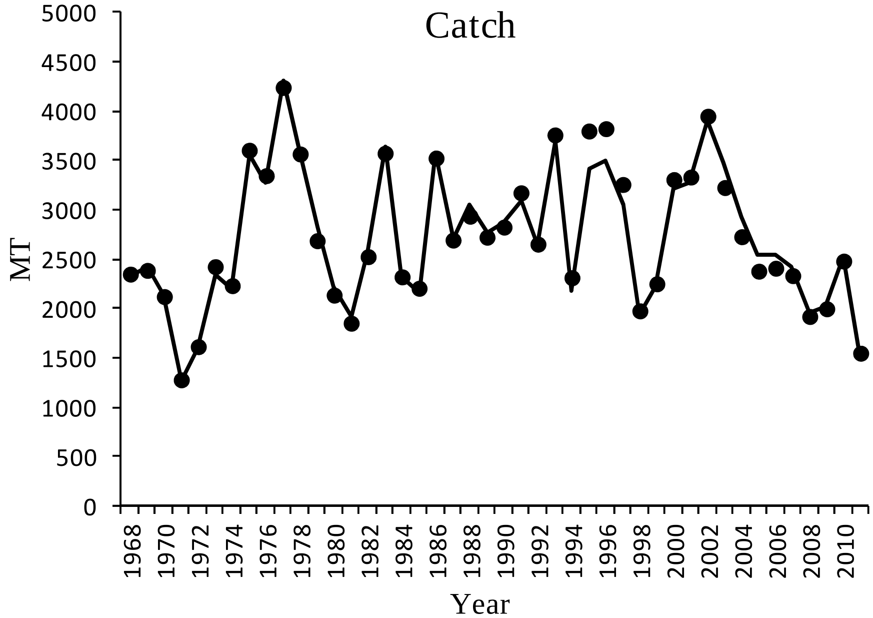


Figure 11. Observed and predicted black sea bass catch (mt) from SCALE model update through 2011.

Figure 12. Estimated fishing mortality (± 2 std dev) of black sea bass through 2011 from SCALE model. Horizontal lines are F_{MSY} ± 80% CI.

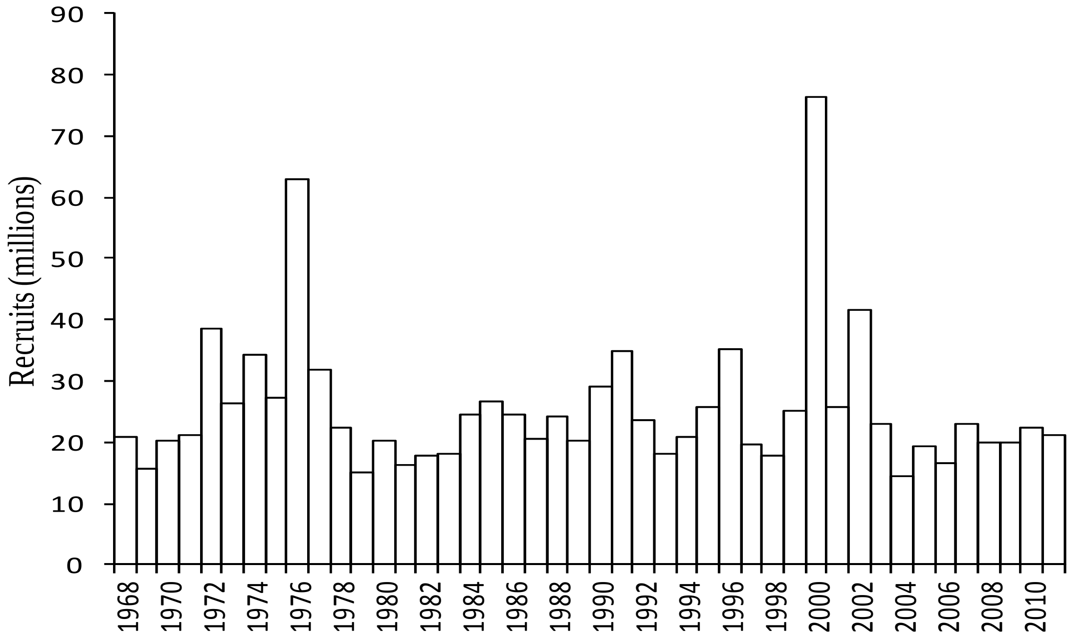


Figure 13. Predicted black sea bass recruitment indices from updated SCALE model.

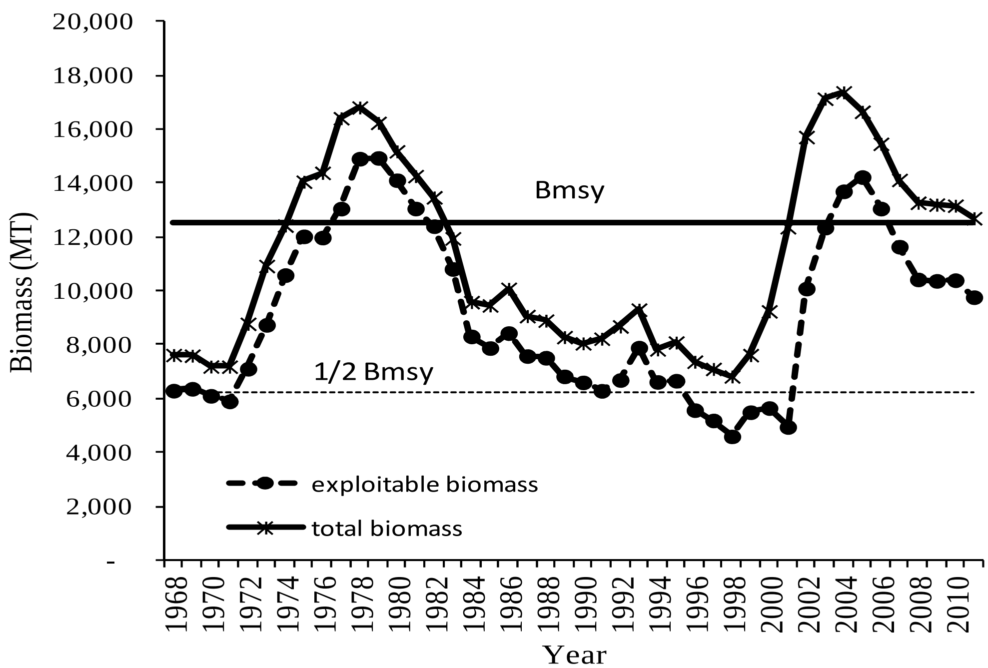


Figure 14. Estimated black sea bass total and exploitable biomass (mt) from SCALE model update, 1968-2011. Also shown are the biological reference points associated with total biomass.

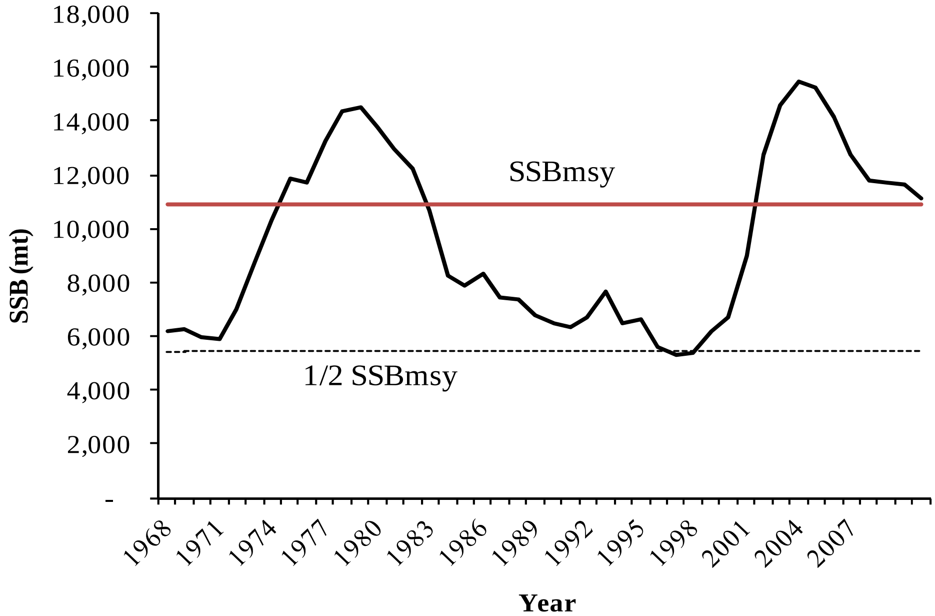


Figure 15. Estimated black sea bass spawning stock biomass (mt) from SCALE model update, 1968-2011. Also shown are deterministic biomass reference points.

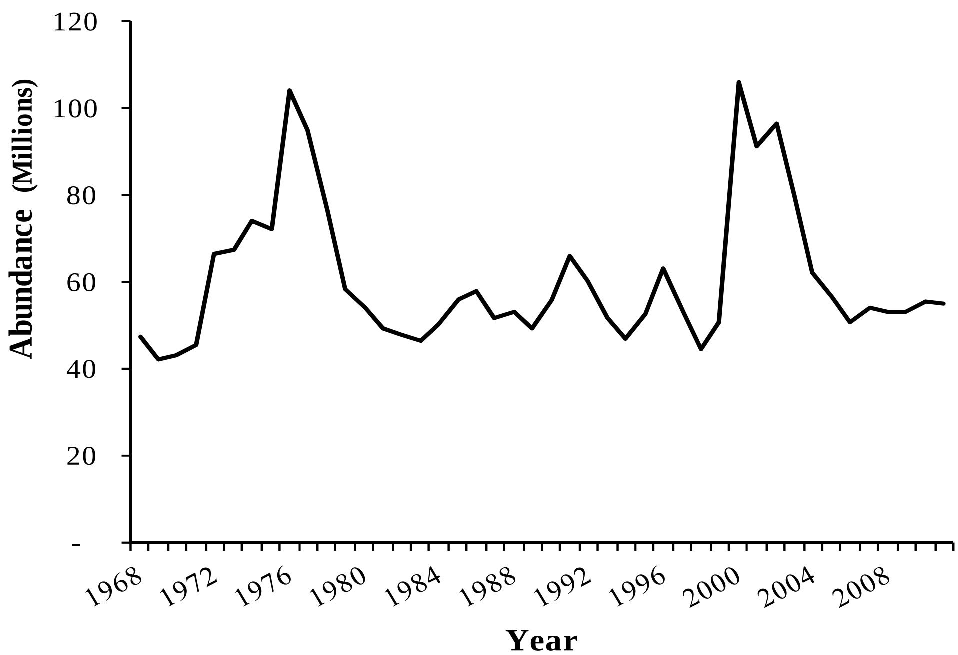


Figure16. Model estimate of total black sea bass abundance (millions, Jan. 1st), from SCALE model update 1968-2011.

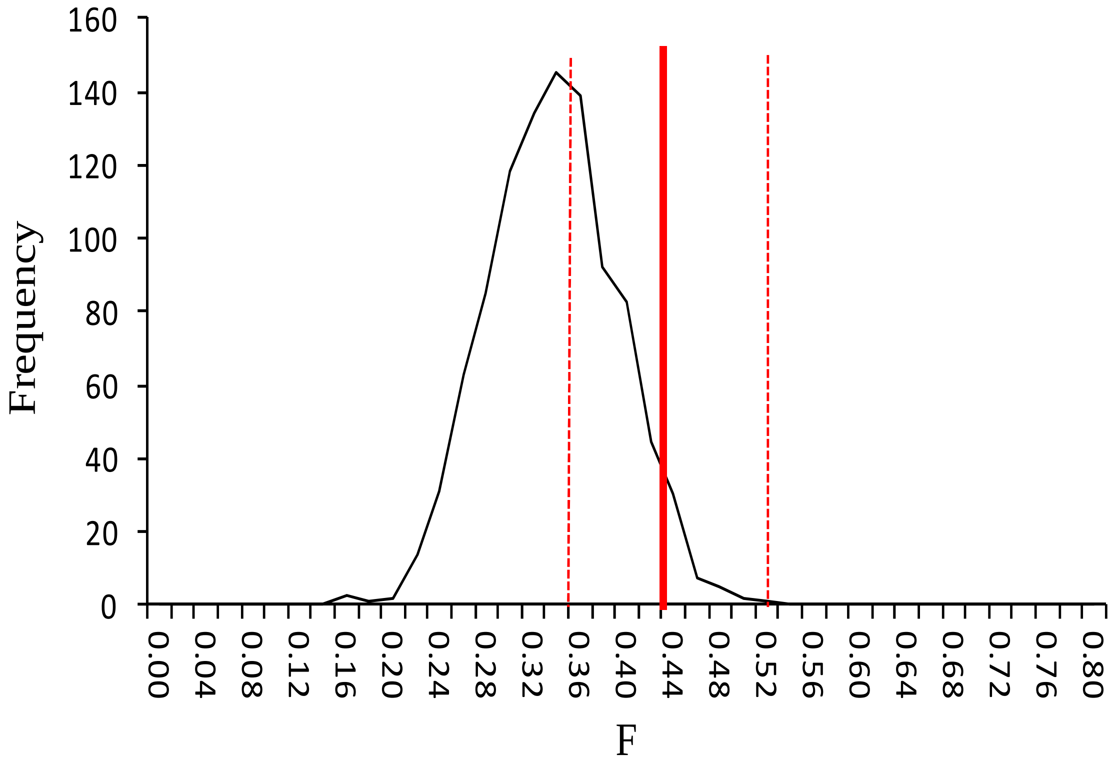


Figure 17. Distribution of 2011 fishing mortality and F_{MSY} ($\pm$ 80% CI)

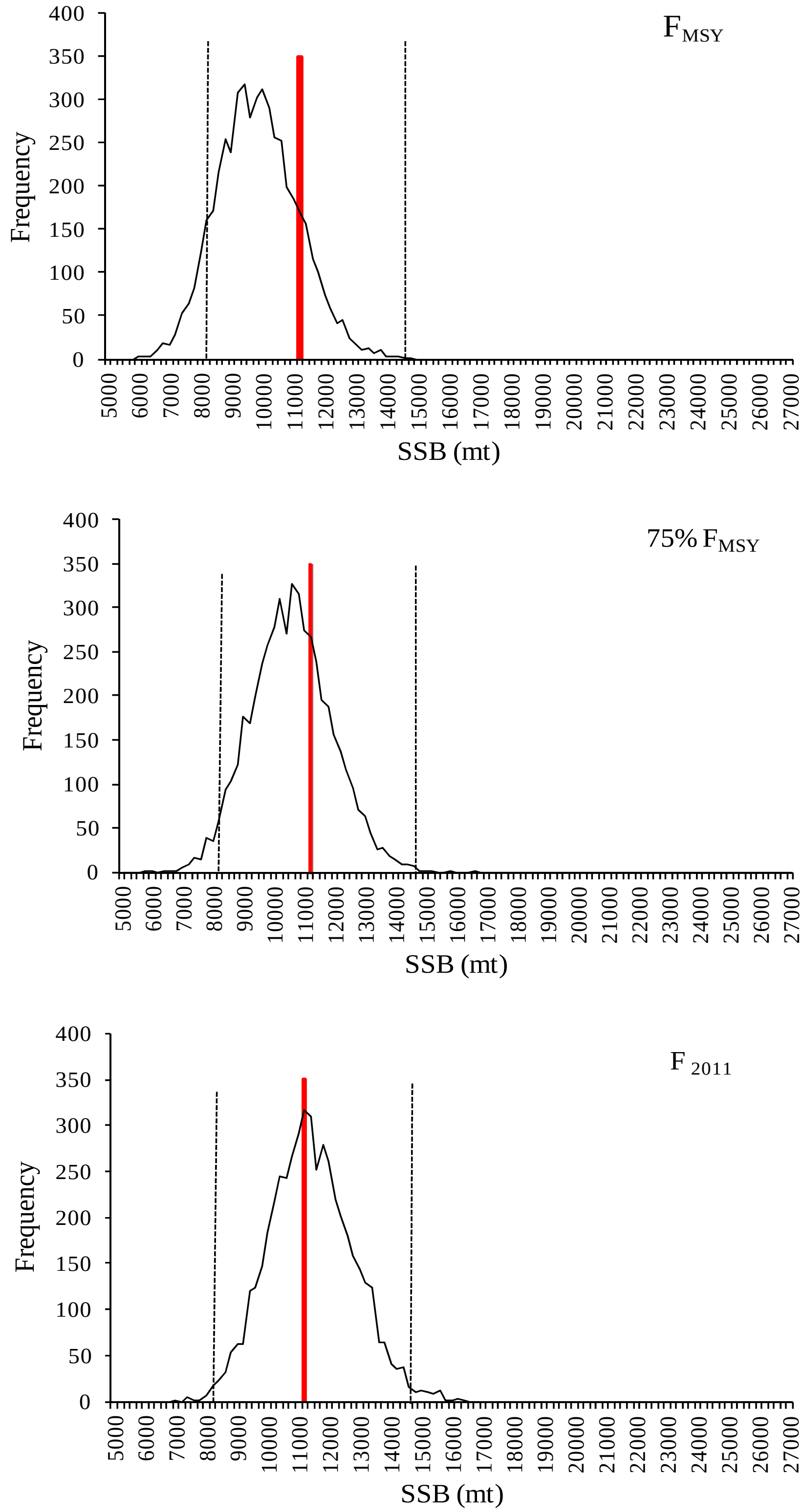


Figure 17. Distribution of Jan 1, 2014 spawning stock biomass (MT) and SSB_{MSY} (red line) $\pm$ 80% CI under 2013 fishing mortalities of F_{MSY} (0.44), 75% F_{MSY} (0.33) and F_{2011} (0.21).

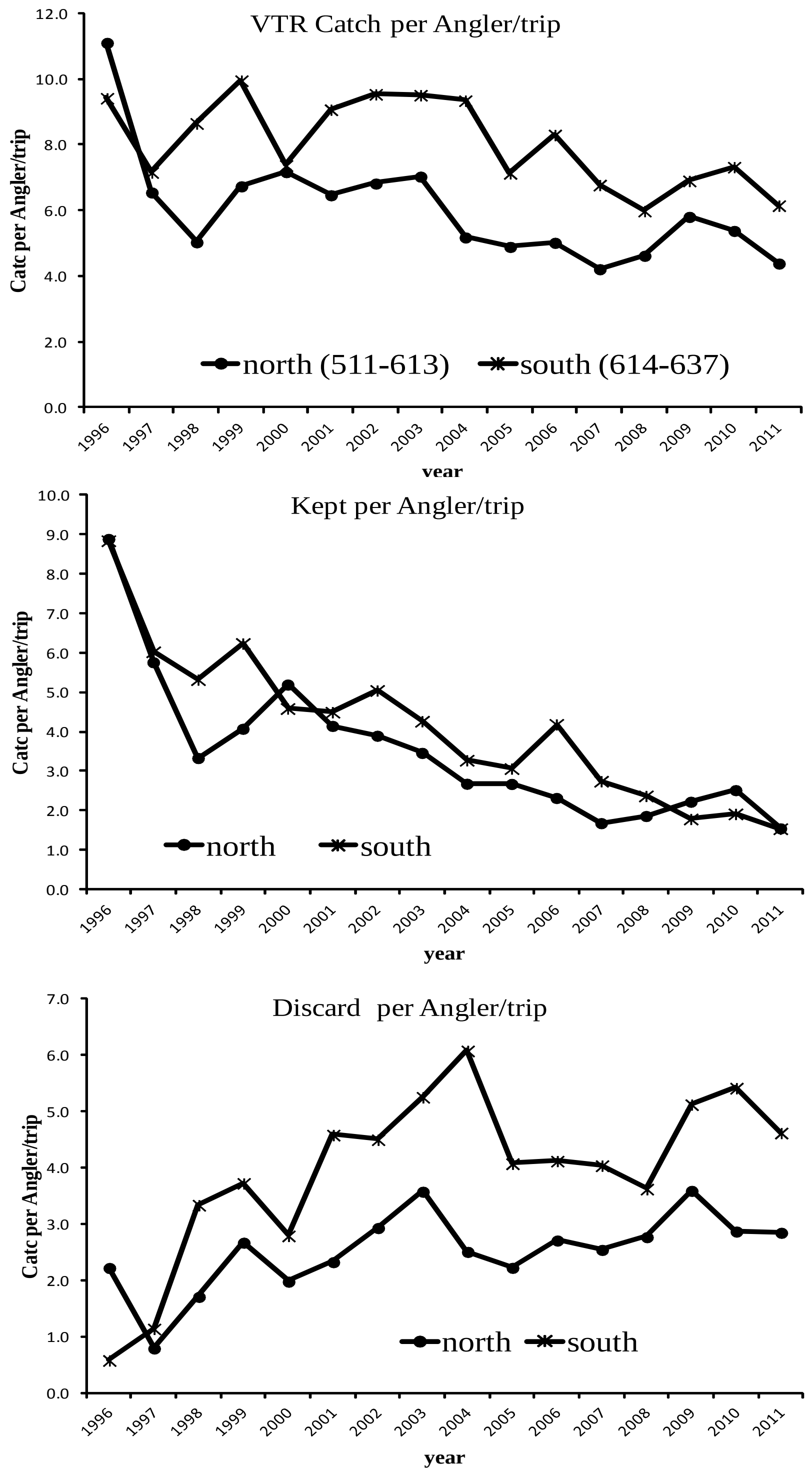


Figure 18. Catch, kept and discard per angler trip for the north (NY –MA) and south (NJ-NC). CPUE derived from recreational party/charter vessel trip reports.

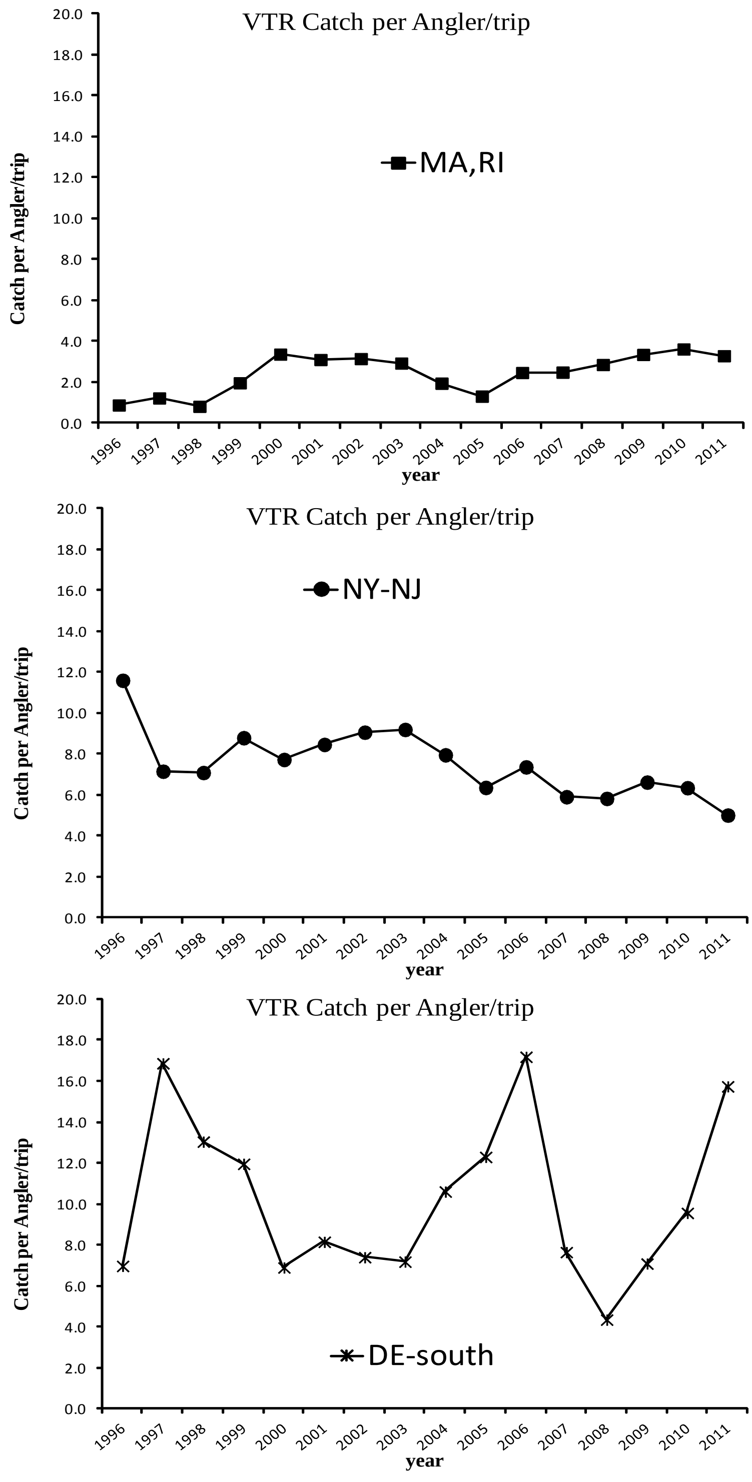


Figure 19. Catch per angler trip for MA-RI, NY-NJ, and DE south. CPUE derived from recreational party/charter vessel trip reports.