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M E M O R A N D U M

DATE: September 15, 2011

TO: Chris Moore, Executive Director

FROM: Jim Armstrong JLA

SUBJECT: Spiny Dogfish ABC and Management Measures for 2012

Summary

The latest spiny dogfish assessment update indicates that the spiny dogfish stock is not overfished and that overfishing is not occurring. The estimate of SSB (169,415 mt; 373.496 M lb) is 106.4 % of the Bmsy proxy, SSB_{MAX} (159,288 mt; 351.170 M lb) and F_{2010} (0.09) is estimated at 36.9% of F_{MSY} (0.2439). Rebuilding, initiated in 2000, was officially recognized to have ended in 2010, the fourth consecutive year for which SSB is estimated to have been above SSB_{MAX} . For 2011, the SSC rejected the existing Fmsy proxy as the basis for OFL and set ABC based on 75% of the catch at target F (F corresponding to 1.5 pups per recruit).

The staff recommendation is an acceptable biological catch (ABC) of 18,245 mt (40.224 M lb) for 2012 which is based on the Council's risk policy of $P^* = 0.35$, $CV = 100\%$, and mean OFL = 25,146 mt (55.437 M lb). If the process proposed in the Omnibus Annual Catch Limit (ACL) and Accountability Measure (AM) Amendment is implemented in time for the 2012 fishing year, then it is also recognized that $ACL = ABC$ for spiny dogfish and that the domestic ACL would be equal to the total ACL minus Canadian landings (6 mt in 2010). Therefore, the domestic $ACL = 18,239$ mt (40.210 M lb). An Annual Catch Target (ACT) that accounts for management uncertainty (net effect < zero in 2009-2010) and that is equal to the domestic ACL is also recommended. After subtracting estimated discards (4,081 mt; 8.997 M lb) and U.S. recreational landings (21 mt (46,300 lbs) from the ACT, total allowable landings (TAL, i.e., commercial quota) for 2012 would be 14,137 mt (31.167 M lb).

Introduction

The specification of spiny dogfish management measures is a joint process conducted annually by the Mid-Atlantic and New England Fishery Management Councils (Councils). A separate specification process is also undertaken by the Atlantic States Marine Fisheries Commission's Spiny Dogfish Management Board (Board). The Northeast Fishery Science Center (Center) updates the spiny dogfish assessment and conducts long-term projections. The Mid-Atlantic Council's Scientific and Statistical Committee (SSC) reviews assessment results and determines

the acceptable biological catch (ABC) for the upcoming year or multi-year period (up to five years) as allowed under the Spiny Dogfish Fishery Management Plan (FMP). ABC is a reduction from the overfishing limit (OFL) based on the SSC's consideration of scientific uncertainty and serves as an upper limit on the catch target that management measures attempt to achieve. The Councils' Spiny Dogfish Monitoring Committee (MC) develops and recommends specific coastwide (Maine – Florida) management measures that will achieve target catch and makes further adjustments to total catch as needed based on management uncertainty. Finally, the Councils, at their respective meetings, develop recommendations to be submitted to the National Marine Fisheries Service.

In this memorandum, information is presented to assist the SSC and MC in their roles in the specification process. Assessment update results are presented briefly and a more detailed *draft* Stock Status Update prepared by the Center is attached under separate cover. That and other listed documents are distributed in conjunction with the staff memo:

Attachment A: Stock Status Update (NEFSC 2011)

Attachment B: SSC Report from 2010

Attachment C: Fmsy Proxy Estimation (Rago 2011)

Management History

A long term landings history (1962-2010) is provided in Table 1 of Attachment A. The federal FMP was developed in 1998 and implemented in 2000 in order to halt large scale depletion of reproductively mature female spiny dogfish and allow the stock to recover to a sustainable level. The directed dogfish fishery of the 1990s harvested primarily the largest (80+ cm) spiny dogfish in the stock, and the species' life history is such that these fish are primarily mature females. The FMP eliminated the directed fishery for spiny dogfish beginning in 2000 by instituting a 4 million pound (1,814 mt) commercial quota that essentially served as a bycatch allowance. Substantial increases in SSB followed and an increase commercial quota to 12 million pounds (5,443 mt) in 2009 was possible while continuing to achieve $F_{rebuild}$. The stock was declared rebuilt in 2010 following a report by TRAC reviewers of re-estimated reference points (NEFSC 2010) and the quota for 2010 was set at 15 million lbs (6,804 mt) and for 2011 was set for 20 million lbs (9,072 mt).

Regulatory Review (Current Management Measures)

For the current 2011 fishing year, the Council's SSC rejected the established Fmsy proxy as the basis for OFL (see Attachment B) and instead used $F = 0.207$, the F-target at the time, to set OFL at 20,267 mt (44.681 M lb). In determining ABC, the SSC applied a P^* of 0.35 and 75% CV for OFL and noted that the result was nearly equivalent to a simple calculation of 75% of OFL, specifically $ABC_{2011} = 15,200$ mt (33.510 M lb).

Based on recommendations from the spiny dogfish monitoring committee, the Council adopted a commercial quota of 20 M lbs (9,072 mt) and trip limits of 3,000 lbs for the 2011 fishing year. The 20 M lb commercial quota accommodated a reduction from ABC to allow for discards (5,897 mt), Canadian landings (113 mt), and recreational landings (34 mt), values taken from the 2009 assessment update. As per the FMP, the 2011 quota was divided with quota Period 1 (May 1 through October 31) allocated 57.9% of the quota (11.580 M lbs), and quota Period 2 (November 1 through April 30) allocated 42.1% of the quota (8.420 M lbs). Period 1 landings for 2011 were

achieved such that federal waters were closed to the possession of spiny dogfish on Sept 1, 2011. Federal waters will re-open Nov 1, 2011.

Biological Reference Points

The B_{MSY} proxy for spiny dogfish is SSB_{MAX} , which is estimated to be 159,288 mt (351.170 M lb), and the level at which the stock is determined to be overfished ($\frac{1}{2} B_{MSY}$) is 79,644 mt (175.585 M lb). The B_{msy} proxy was reviewed and accepted by TRAC reviewers in 2010 and is described in Rago and Sosebee (2010).

Overfishing is defined as occurring above the F_{MSY} proxy which is estimated to be 0.2349. In light of the previous year's rejection by the SSC of the established F_{msy} proxy (0.325; Attachment B), a revised estimate was needed for the current ABC setting exercise. That estimate (0.2439) was accepted for use as a basis for OFL by an SSC working group on August 19, 2011, and the corresponding report is included as Attachment C.

Stock Biomass

The spiny dogfish stock is not overfished. The updated stochastic estimate of female spawning stock biomass (SSB) for 2010 is about 6% above SSB_{max} (159,288 mt). This is the fourth consecutive year in which the SSB estimate has been above SSB_{max} . The specific estimate of SSB is 169,415 mt. The probability that the SSB_{2011} is above SSB_{max} is estimated to be greater than 50%. The probability that SSB_{2011} is above the biomass threshold (79,644 mt, i.e., $\frac{1}{2} SSB_{max}$) is estimated to be 100%.

Uncertainty in the biomass estimate is accounted for in the underlying variability in the spring trawl survey data as well as uncertainty in the size of the footprint of the average trawl tow. Uncertainty in the Ricker S-R based biomass reference point is accounted for in the confidence interval associated with model fit.

Fishing Mortality

Several sources of removals contribute to the estimate of F for the most recent complete fishing year (2010). These include U.S. commercial landings (5,440 mt), Canadian commercial landings (6 mt), Distant Water Fleet landings (127 mt), U.S. commercial discards (4,081 mt), and U.S. recreational landings (21 mt). Total removals in 2010 were approximately 9,675 mt corresponding to a stochastic F estimate of $F_{2010} = 0.09$, below the overfishing threshold of $F = 0.2439$ and also below the F -target that was the basis for management in 2010 (0.11). The probability that *overfishing is not occurring* ($F_{2010} < F_{threshold}$) is approximately 100%.

Uncertainty is quantified in model estimates of F (essentially the ratio of total catch to estimated biomass) and is based on uncertainty in biomass as well as variance associated with discard estimates, sex ratio, size composition, selectivity and other parameters (Attachment A). Uncertainty in the fishing mortality reference point corresponding to OFL is also estimated (Attachments A and C).

Other Sources of Uncertainty

Because spiny dogfish biomass estimates are primarily based on catches in the Center's spring trawl survey, an important source of uncertainty is the calibration between the R/V Albatross and

FSV Bigelow. The efficiency of the RV Albatross net is estimated to be approximately 64% that of the FSV Bigelow.

Other important sources of scientific uncertainty:

- Canadian landings
- Changes in selectivity
- Discards
- Scaling with landings
- Fate of discarded fish
- Scale of population—Q
- Sex ratios of landings
- Male dogfish

Projections

As part of the stock status report, long-term stochastic projections were generated that allow transient population conditions to more-or-less fully work their way through for this long-lived species. These projections extend alternative near-term harvest policy through the year 2040 and include two harvest scenarios: fishing at F_{msy} (0.2439) and at 75% of F_{msy} (0.1829). Projection results are provided in Tables 10 and 12 in Attachment A and the distribution of catch for 2012-2014 is provided in Tables 11 and 13 in Attachment A. The long-term projections are characterized by oscillations (See Figures 4 and 5 in Attachment A). A decline beginning in 2013 is expected due to recruitment into the SSB of the small 1997-2003 year classes. After projected SSB reaches a low in about 2020, a subsequent increase is expected and is associated with the resumption of "normal" recruitment that has been observed since 2004.

OFL, ABC

For OFL and ABC, the following definitions are suggested:

OFL = Total catch at the F_{msy} proxy (0.2439) in 2012

ABC = Total catch based on the Council's risk policy for Tier 3, the previously designated assessment level for dogfish. Specifically, an assumed 100% CV for OFL, noting that the ratio of B/BMSY is greater than 1, and that spiny dogfish exhibit an atypical life history, such that $P^* = 0.35$.

The mean estimate of OFL corresponding to the accepted F_{msy} proxy (0.2439) is 25,146 mt (55.437 M lb). Using the risk policy approach above, the corresponding ABC is 18,245 mt (40.224 M lb).

Single Year vs. Multi-Year

In the previous year's ABC setting exercise, the SSC based its multi-year OFL/ABC recommendations directly on the long-term projection tables provided in the stock status update. The SSC based their recommendations on a constant F harvest policy, specifically for OFL where $F = 0.207$ for 1 – 5 years, and where ABC is 75% of OFL in each year. Applying the same logic to current information, OFL would be based on the F_{msy} proxy (0.2439) projection table (Table 10 in Attachment A). Note, however, that fishing at OFL results in a transition to

B/Bmsy < 1 in 2014 which affects P* calculation of ABC. Additionally, because these multi-year ABC estimates are based on the Fmsy projections, they become increasingly precautionary as the stock is subjected to fishing mortality each year at OFL. Projections of OFL and ABC are provided below.

YEAR OFL (mt) (based on F=Fmsy = 0.2439 each year)

2012	25,146
2012-2014	25,146, 25,363, 24,928
2012-2016	25,146, 25,363, 24,928, 24,067, 23,076

and ABC would be b such that:

YEAR ABC (mt) (based on applying P* = 0.35 to OFL for each year)

2012	18,245
2012-2014	18,245, 18,403, 17,635*
2012-2016	18,245, 18,403, 17,635*, 15,405*, 13,555*

ABC values with asterisks indicate years when B/Bmsy < 1.

A more reasonable method for calculating multi-year ABC may be to use constant F projections at the F corresponding to achieving ABC in 2012 (approximately 0.177). Table 12 in Attachment A reflects projections at F = 0.1829 (75% of Fmsy) and values are therefore slightly greater than the corresponding ABC. The table suggests, however, that setting ABC between 18,000 and 19,000 mt for 2012-2016 would likely maintain SSB very near SSB_{max}. A further projection table is needed to corroborate this proposition.

ACL/ACT

ACL.

According to the specifications process envisioned in the Omnibus ACL/AM Amendment (Amendment 2 to the Spiny Dogfish FMP) the Council's will specify an ACL equal to ABC for a given year (Figure 1). Additionally, a reduction from ACL to accommodate Canadian landings is made to derive the domestic ACL. Canadian landings have declined sharply and were 113 mt in 2009 and only 6 mt in 2010. For 2012, it is suggested that the most recent year Canadian landings (6 mt) be used to calculate the domestic ACL.

ACT.

According to the Omnibus Amendment, an ACT is set to account for management uncertainty. The Spiny Dogfish Monitoring Committee will characterize and comment on sources of management uncertainty in developing its recommendation to the Councils.

Ability to control harvest. Table 1 provides the specified annual quotas and realized landings since the implementation of the FMP (2000). Note that an ISFMP was not developed until 2003. Spiny dogfish landings deviated from specified federal landings in most years during the rebuilding period (2000-2010), however, these were generally a reflection of differing state quotas. The more liberal quotas put in place in 2003-2008 by the ASMFC essentially determined total harvest. Since 2009, when the ASMFC implemented accountability measures for spiny dogfish, total landings have been less than the amount specified through the federal management system. It is suggested that for 2012 specifications, the fishery is more likely to reflect behavior in 2009-2010 than previous years.

Ability to predict discard levels. Prior to 2010, discard estimates were taken directly from projection tables provided in the stock status update. In these tables, discard estimates reflect a

static long term ratio of landings to discards (approximately 70% discards). To the extent that future discards are consistent with that ratio, an accurate reduction for discards will be made. Note that discards have been very stable as U.S. commercial landings have increased (Figure 2 top) such that the ratio of discards to landings has declined (Figure 2 bottom). Additionally, changes in total effort for 2010 as a result of the transition to sector management in New England were expected (Amendment 16 estimated total effort reduction of approximately 30%). Discards in 2010 were indeed lower than in 2009 and the calendar year 2010 discards do not reflect an entire fishing year (May 1, 2010 - Apr 30, 2011) of sector management. It is suggested that the 2012 discard estimate be based on observed 2010 discards rather than a long-term ratio or average.

TAL

The TAL (i.e., commercial quota) for 2012 and subsequent years is calculated according to the process illustrated in Figure 1. Accordingly, all other accountable sources of removals are deducted from the ACT (18,239 mt; 40.210 M lb) to arrive at the TAL. For 2012, these other sources include U.S. discards (4,081 mt; 8.997 M lb), and recreational landings (21 mt; 46,297 lb) resulting in a TAL of 14,137 mt (31.167 M lb). These deductions would also be made for each year if multi-year specifications were adopted.

Allocation of the Commercial TAL

Under the FMP's current configuration, the annual commercial TAL is allocated seasonally between Period 1 (May 1 – Oct 31; 57.9%) and Period 2 (Nov 1 – Apr 30; 42.1%). For 2012, this would be 18.046 M lbs in Period 1 and 13.121 M lb in Period 2.

Trip Limits

No adjustment to the existing 3,000 pound trip limits is recommended.

Summary

Management measures for 2012 – 2016 are summarized in Table 2.

The spiny dogfish population is not overfished and overfishing is not occurring for this stock.

For 2012, based on the information provided and the proxy Fmsy reference point, OFL is 25,146 mt (55.437 M lb), and ABC is 18,245 mt (40.224 M lb).

After deducting for other sources of mortality, the TAL for 2012 would be 14,137 mt (31.167 M lb).

SSB is expected to decline from 2013 to 2019 regardless of near-term harvest strategy. As such, long term population conditions should be considered in determining ABC.

Suggested definitions of OFL and ABC are based on projected catches at the proxy Fmsy reference point. Projections at F needed to achieve ABC, if they become available, may be more accurate.

ABC recommendations over a five year specification time frame (2012 – 2016) would provide the Council with flexibility in terms of management options. However, there is increased uncertainty (scientific and management) involved in multi-year specifications.

References

Attachment A. Rago PJ and KA Sosebee. 2011. Update on the status of spiny dogfish in 2010 and initial evaluation of alternative harvest strategies. Report to MAFMC SSC September 12, 2011. 32 p.

Attachment B. SSC Report from September 2010. 18 p.

Attachment C. Rago 2011. Estimation of an FMSY Proxy Reference Point for Spiny Dogfish. Report to Mid-Atlantic Fishery Management Council Science and Statistical Committee August 10, 2011. 30 p.

Rago PJ and KA Sosebee. 2010. Biological Reference Points for Spiny Dogfish . Northeast Fish Sci Cent Ref Doc. 10-06; 52 p. <http://www.nefsc.noaa.gov/publications/crd/crd1006/>

Spiny Dogfish Flowchart

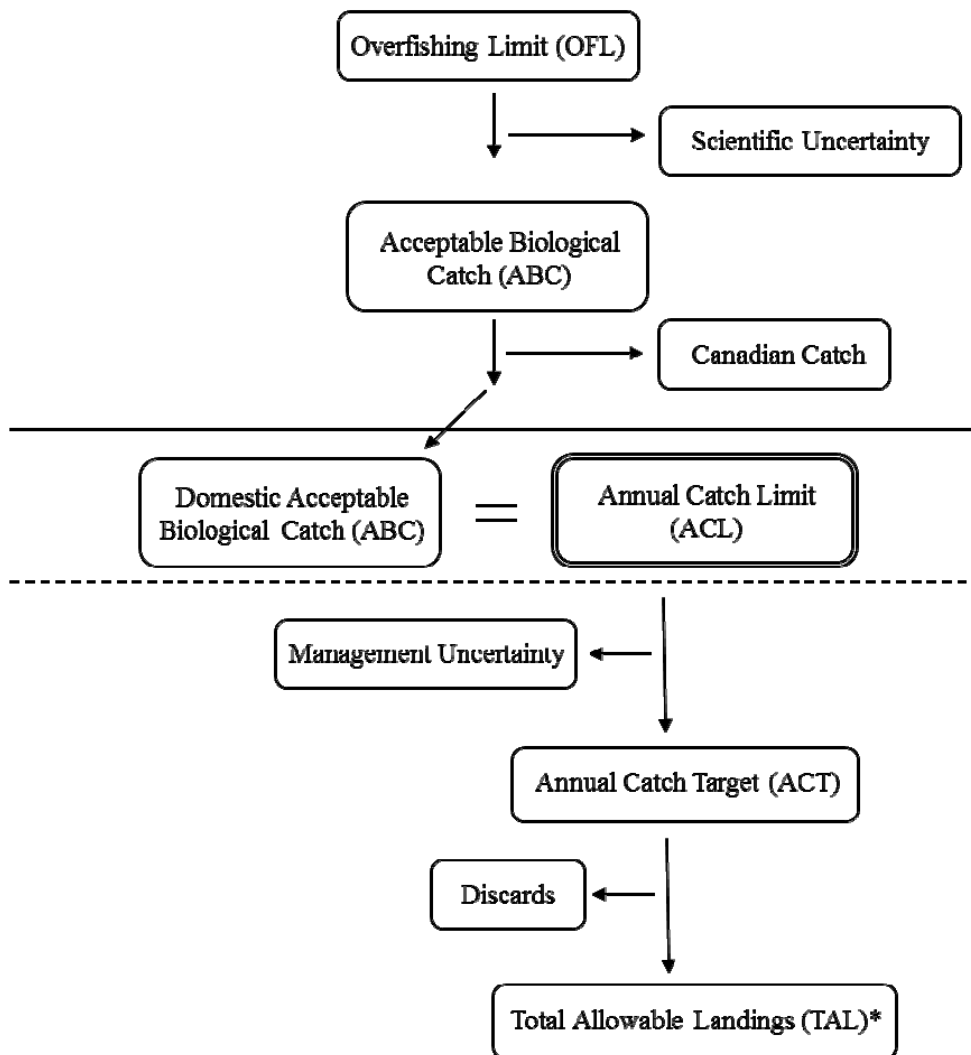


Figure 1. Specification process for spiny dogfish catch regulations as described in the Omnibus ACL/AM Amendment (currently in rulemaking).

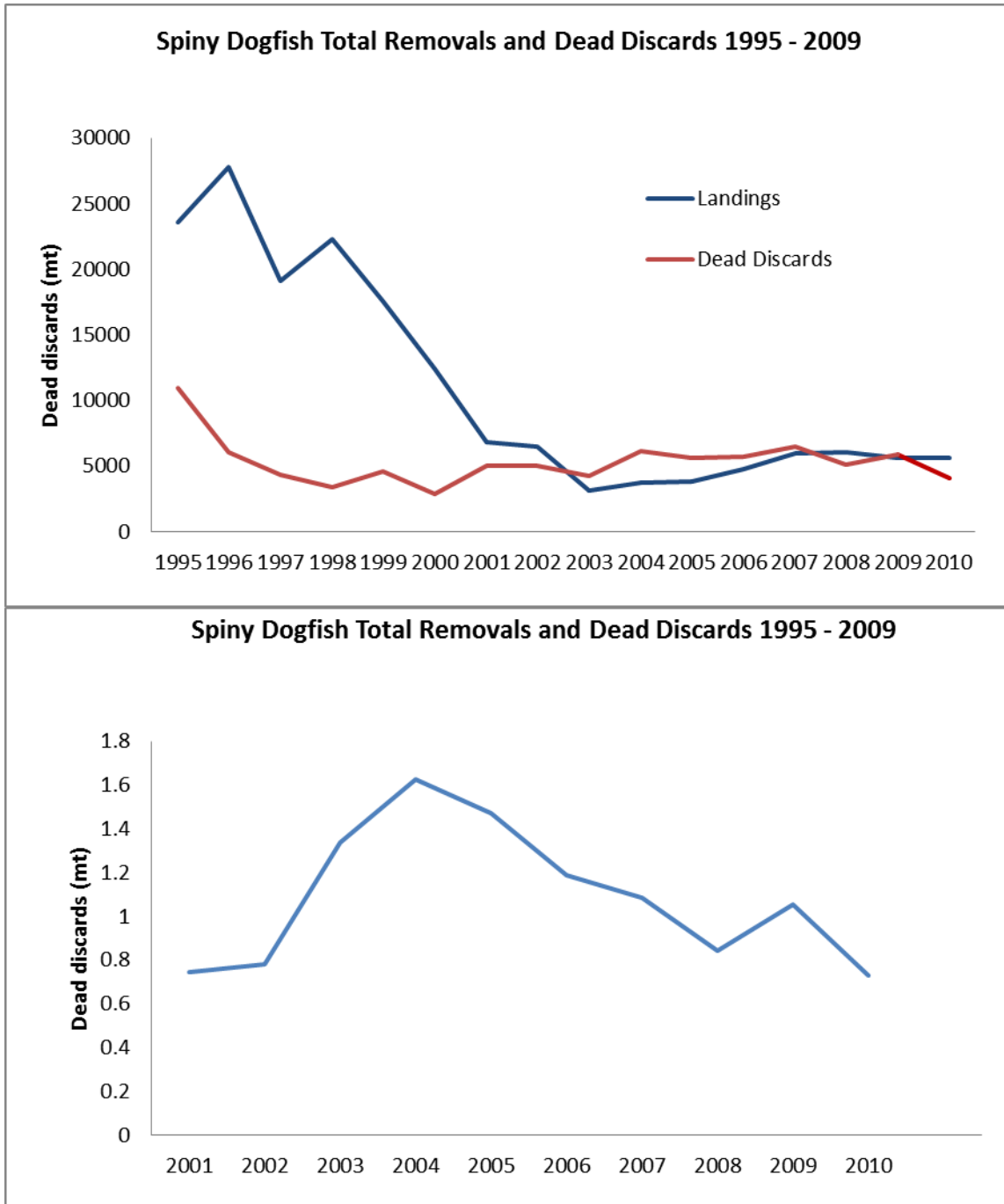


Figure 2. Relative values for discards and landings of spiny dogfish 2000 – 2010 (top) and ratio of dead discards to landings 2000 – 2010 (bottom).

Table 1. Federal and State quotas compared to realized landings 2000-2010.

Fishing Year (May 1 - Apr 30)	Quota (M lb)		Landings (M lb)	Difference from federal
	Federal quota	States' quota		
2000	4.000	emerg. act.*	8.178	1.044
2001	4.000	emerg. act.*	5.100	0.275
2002	4.000	emerg. act.*	4.775	0.194
2003	4.000	8.800	3.244	-0.189
2004	4.000	4.000	1.537	-0.616
2005	4.000	4.000	2.592	-0.352
2006	4.000	6.000	6.603	0.651
2007	4.000	6.000	6.498	0.624
2008	4.000	8.000	8.985	1.246
2009	12.000	12.000	11.901	-0.008
2010	15.000	14.400	14.161	-0.056

Table 2. Proposed management measures for 2012- 2016.

2012 Measures	Basis	M lb	Mt
OFL	$F_{MSY} (0.2439)$	55.437	25,146
ABC	P^* for Level 3	40.223	18,245
ACL	= ABC	40.223	18,245
Domestic ACL	= ACL - Canadian Landings	40.210	18,239
Mgmt Uncertainty Buffer	Mgmt Uncert Offset by Hx Underages	0.000	0
ACT	= Domestic ACL - management uncertainty	40.210	18,239
U.S. Discards	2009 Estimate	8.997	4,081
U.S. Rec Landings	2009 Estimate	0.046	21
TAL (Comm Quota)	ACT - Discards and Rec Landings	31.167	14,137

2013 Measures	Basis	M lb	Mt
OFL	$F_{MSY} (0.2439)$	55.916	25,363
ABC	P^* for Level 3	40.572	18,403
ACL	= ABC	40.572	18,403
Domestic ACL	= ACL - Canadian Landings	40.558	18,397
Mgmt Uncertainty Buffer	Mgmt Uncert Offset by Hx Underages	0.000	0
ACT	= Domestic ACL - management uncertainty	40.558	18,397
U.S. Discards	2009 Estimate	8.997	4,081
U.S. Rec Landings	2009 Estimate	0.046	21
TAL (Comm Quota)	ACT - Discards and Rec Landings	31.515	14,295

2014 Measures	Basis	M lb	Mt
OFL	$F_{MSY} (0.2439)$	54.957	24,928
ABC	P^* for Level 3	38.879	17,635
ACL	= ABC	38.879	17,635
Domestic ACL	= ACL - Canadian Landings	38.865	17,629
Mgmt Uncertainty Buffer	Mgmt Uncert Offset by Hx Underages	0.000	0
ACT	= Domestic ACL - management uncertainty	38.865	17,629
U.S. Discards	2009 Estimate	8.997	4,081
U.S. Rec Landings	2009 Estimate	0.046	21
TAL (Comm Quota)	ACT - Discards and Rec Landings	29.822	13,527

2015 Measures	Basis	M lb	Mt
OFL	$F_{MSY} (0.2439)$	53.059	24,067
ABC	P^* for Level 3	33.962	15,405
ACL	= ABC	33.962	15,405
Domestic ACL	= ACL - Canadian Landings	33.949	15,399
Mgmt Uncertainty Buffer	Mgmt Uncert Offset by Hx Underages	0.000	0
ACT	= Domestic ACL - management uncertainty	33.949	15,399
U.S. Discards	2009 Estimate	8.997	4,081
U.S. Rec Landings	2009 Estimate	0.046	21
TAL (Comm Quota)	ACT - Discards and Rec Landings	24.906	11,297

Table 2 (cont'd). Calculation of management measures for 2012- 2016.

2016 Measures	Basis	M lb	Mt
OFL	<i>F_{MSY} (0.2439)</i>	50.874	23,076
ABC	<i>P* for Level 3</i>	29.884	13,555
ACL	<i>= ABC</i>	29.884	13,555
Domestic ACL	<i>= ACL - Canadian Landings</i>	29.870	13,549
Mgmt Uncertainty Buffer	<i>Mgmt Uncert Offset by Hx Underages</i>	0.000	0
ACT	<i>= Domestic ACL - management uncertainty</i>	29.870	13,549
U.S. Discards	<i>2009 Estimate</i>	8.997	4,081
U.S. Rec Landings	<i>2009 Estimate</i>	0.046	21
TAL (Comm Quota)	<i>ACT - Discards and Rec Landings</i>	20.827	9,447