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MEMORANDUM

DATE: June 1, 2011

TO: SC/OQ Committee (Anderson, Himchak, Berg, King, Schafer, Gilmore) and Council

FROM: Tom Hoff and José Montañez TBH JMM

SUBJECT: Committee Meeting June 15

The Surfclam/Ocean Quahog and Tilefish Committee will meet at the Council meeting on June 15 at 9:30 until 11:00 with the Council as a Committee of the Whole. The sole purpose of the meeting is to review the current data and decide whether any changes are needed for the surfclam, ocean quahog, and/or Maine ocean quahog quotas for 2012 and 2013. No action is needed if the Council wishes to maintain the quotas recommended last year. The Council does need to make a recommendation to the RA to suspend the surfclam minimum size limit if it so desires.

Staff recommends maintaining last year's quota recommendations for 2012 and 2013 of: surfclams = 3.4 million bushels, ocean quahogs = 5.333 million bushels, and Maine ocean quahogs = 100,000 Maine bushels. Staff also recommends the Council recommend to the RA that the minimum surfclam size limit continue to be suspended.

Behind this memo please find the staff overview (which includes the 2009 surfclam and ocean quahog assessment summaries as Appendices), two Advisor letters advocating maintenance of the quotas and three Advisor emails also advocating maintenance of the quotas. The pertinent sections of the May 2010 SSC Consensus report are included in the staff overview report as sections V.B.1. and V.B.2.

The Science Center is scheduled to conduct another clam survey on the *RV Delaware II* this summer and a new surfclam stock assessment is scheduled for 2012 that will form the basis for quota recommendations for 2014, 2015 and 2016.

Overview of the Surfclam and Ocean Quahog Fisheries and Quota Considerations for 2012 and 2013

June 2011

Mid-Atlantic Fishery Management Council

in cooperation with the

National Marine Fisheries Service

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Last Revised: June 1, 2011

EXECUTIVE SUMMARY

- Quotas were set last year for 2011, 2012, and 2013.
- No action is required by Council if choose to maintain 2012 and 2013 quotas.
- Surfclams are not overfished and overfishing is not occurring.
- Surfclam ABC for 2011-2013 is 213 million pounds (12.5 million bushels).
- Delmarva, inshore NJ, and inshore NY fisheries in trouble.
- Surfclam LPUE continues steady decline.
- Surfclam LPUE in Exempted Fishery on Georges Bank 10X higher than generally fished areas.
- PSP testing protocol authority for RA added to Amendment 15.
- Ocean Quahogs are not overfished and overfishing is not occurring.
- Ocean Quahog ABC for 2011-2013 in exploited area is 57.6 million pounds (5.8 million bushels).
- Ocean Quahog LPUE is stable.
- Ocean Quahog resource and fishery in Maine stable. No PSP closures in Maine recently.
- Landings in 2010 only 69% for surfclams, 67% for ocean quahogs, and 56% for Maine OQ.
- In 2010 only 8.1% of coastwide surfclam landings were smaller than 4.75 inches.
- Landings through May 15, 2011 (37% of year): SC (22%), OQ (20%), and Maine OQ (16%).
- Staff recommends maintenance of surfclam (57.8 million pounds), ocean quahog quota (53.3 million pounds), Maine ocean quahog quota (1.1 million pounds), and continuation of suspension from minimum size for surfclams.

I. Introduction

This document provides a summary of relevant information for the purpose of specifying quotas for surfclams (*Spisula solidissima*) and ocean quahogs (*Arctica islandica*) in federal waters. Management responsibility for these two species resides with the Mid-Atlantic Fishery Management Council. The management regime is detailed in the *Fishery Management Plan (FMP) for the Atlantic Surfclam and Ocean Quahog Fishery* and subsequent Amendments to the Plan. Amendment 8 (MAFMC 1988) provided the most substantial change in the management regime through introduction of Individual Transferable Quotas (ITQs), which replaced a complex system of time and effort restrictions.

The primary tool in the management of surfclams and ocean quahogs in federal waters is the specification of annual quotas, which are allocated to the holders of allocation shares at the beginning of each calendar year. With implementation of Amendment 13 (MAFMC 2003), the Council received the authority to recommend multi-year quotas to the Secretary of Commerce that span the upcoming three years. In June of 2004 the Council recommended their first series of multi-year quotas for 2005, 2006, and 2007 (Table 1). The Secretary reviewed and accepted them. Staff continues to produce the annual quota recommendation papers and when there are no changes from the three year recommendations, there is no need for any Council activity (as was the case for the 2007 quota); however when the Council decides to change its recommendations from the initial three year recommendations (as was the case for the 2006 ocean quahog quota), the Council needs to recommend those specific changes to the Secretary. In June of 2007 the Council recommended its second set of three-year quotas which were for 2008, 2009, and 2010 (Table 2). The Secretary reviewed and also accepted them. In June of 2010, the Council recommended it third multi-year quotas for 2011, 2012, and 2013 (Table 3). In June of 2011, the Council will review the 2012 and 2013 quota recommendations and decide whether to maintain or change those recommendations.

Table 1. Quota Specifications for 2005, 2006, and 2007.			
Year	2005	2006	2007
Surfclams	3.400 million. bu.	3.400 million. bu.	3.400 million. bu.
Ocean Quahogs	5.333 million. bu.	5.333 million. bu.	5.333 million. bu.
Maine Ocean Quahogs	100,000 ME bu.	100,000 ME bu.	100,000 ME bu.

Table 2. Quota Specifications for 2008, 2009, and 2010.			
Year	2008	2009	2010
Surfclams	3.400 million. bu.	3.400 million. bu.	3.400 million. bu.
Ocean Quahogs	5.333 million. bu.	5.333 million. bu.	5.333 million. bu.
Maine Ocean Quahogs	100,000 ME bu.	100,000 ME bu.	100,000 ME bu.

I. A. Staff Recommendations for 2012 and 2013

Table 3. Quota Recommendations for 2012 and 2013 (2011 existent).			
Year	2011	2012	2013
Surfclams	3.400 million. bu.	3.400 million. bu.	3.400 million. bu.
Ocean Quahogs	5.333 million. bu.	5.333 million. bu.	5.333 million. bu.
Maine Ocean Quahogs	100,000 ME bu.	100,000 ME bu.	100,000 ME bu.

I. B. FMP Objectives and Management Unit

The following four objectives were implemented with Amendment 8 (MAFMC 1988) and have not been changed at all during the 20 plus years of management under the ITQ system.

1. Conserve and rebuild Atlantic surfclam and ocean quahog resources by stabilizing annual harvest rates throughout the management unit in a way that minimizes short term economic dislocations.

2. Simplify to the maximum extent the regulatory requirement of surfclam and ocean quahog management to minimize the government and private cost of administering and complying with regulatory, reporting, enforcement, and research requirements of surfclam and ocean quahog management.

3. Provide the opportunity for industry to operate efficiently, consistent with the conservation of surfclam and ocean quahog resources, which will bring harvesting capacity in balance with processing and biological capacity and allow industry participants to achieve economic efficiency including efficient utilization of capital resources by the industry.

4. Provide a management regime and regulatory framework which is flexible and adaptive to unanticipated short term events or circumstances and consistent with overall plan objectives and long term industry planning and investment needs.

The management unit is all Atlantic surfclams (*Spisula solidissima*) and ocean quahogs (*Arctica islandica*) in the Atlantic EEZ. In 1988 the American Malacological Union officially changed the common name of "surf clam" to the one word name "surfclam". This was published in the American Fisheries Society special publication 16 entitled *Common and Scientific Names of Aquatic Invertebrates from the United States and Canada: Mollusks* (American Fisheries Society 1988). The ocean quahogs managed in this FMP include a small-scale fishery in eastern Maine that harvests small ocean quahogs which are generally sold for the half-shell market. Locally these small ocean quahogs off the coast of Maine are known as "mahogany quahogs" and have been under Council management since implementation of Amendment 10 (MAFMC 1998).

A southern subspecies of surfclam, *Spisula solidissima similis*, occurs south of Cape Hatteras (Walker and Heffernan 1994). Another species, *Spisula raveneli*, occurs in the southern part of the range of *S. solidissima*. This species distinction, based on distribution and morphology (Porter and Schwartz 1981), is controversial (Vecchione and Griffis 1996).

II. Surfclam Resource and Fisheries

II. A. Surfclam Life History and Distribution

Surfclams are bivalve mollusks which are distributed in the western North Atlantic from the southern Gulf of St. Lawrence to Cape Hatteras. Commercial fisheries have generally concentrated on the populations of surfclams which have flourished in the high-energy, sandy ocean sediments off the coast of New Jersey and the Delmarva peninsula. Growth rates are relatively rapid, with clams reaching the preferred harvest size (approximately 5 inches) in about six years. Maximum size is about 9 inches in length, though individuals larger than 8 inches are rare. Maximum age is approximately 35 years, and while some individuals reach sexual maturity within three months, most spawn by the end of their second year.

In the mid-Atlantic region, surfclams are found in the relatively shallow waters from the beach zone to a depth of about 150 feet. Substantial fisheries have been present in the 3-mile jurisdictions of the States of New Jersey and New York.

Traditionally, surfclams' dominant use has been in the "strip market" to produce fried clams. In recent years, however, they have increasingly been used in chopped or ground form for other products, such as high-quality soups and chowders.

II. B. Stock Status

The Atlantic surfclam stock in the US EEZ is not overfished and overfishing is not occurring (USDC 2009b and Surfclam Assessment Summary -- Appendix 1). Estimated fishable stock biomass in 2008 (survey year, 4.75 inch shell length) was 1.93 billion pounds of meats which is above the management target of ½ the 1999 biomass level of 1.19 billion pounds of meats (Table 4). Estimated fishing mortality in 2008 was 0.027, which is below the management threshold of 0.15. These SAW estimates are for the

entire EEZ stock, including the portion of the EEZ stock on Georges Bank (GKB) which is not currently available because of Paralytic Shellfish Poisoning (PSP).

Table 4. Surfclam and Ocean Quahog Biological Reference Points, Their Basis, and Estimated Value with the Biomass Expressed in Pounds.

Reference Point	Basis	Estimated Value
Surfclams		
Biomass Target	½ Current (1999) Biomass (proxy for B_{MSY})	1.19 billion pounds
Biomass Threshold	½ Proxy for B_{MSY}	599 million pounds
2008 Fishable Biomass		1.93 billion pounds
ABC for 2011-2013		213 million pounds
Fishing Target	$F_{target} < F_{threshold}$	Set by Council selected quota
Fishing Mortality Threshold	F = M	0.15
2008 F		0.027
Ocean Quahogs		
Biomass Target	½ Virgin Biomass	3.94 billion pounds
Biomass Threshold	¼ Virgin Biomass	1.97 billion pounds
2008 Fishable Biomass		6.4 billion pounds
ABC for 2011-2013		57.6 million pounds
Fishing Mortality Target	$F_{o.1}$	0.028
Fishing Mortality Threshold	$F_{25\%MSP}$	0.052
Amend. 15 Biomass Threshold (proposed)	40% Virgin Biomass	3.16 billion pounds
Amend. 15 Fishing Target (proposed)	$F_{target} < F_{threshold}$	Set by Council selected quota
Amend. 15 Fishing Threshold (proposed)	$F_{45\%MSP}$	0.022
2008 F, exploited areas		0.010

The most important development in the surfclam resource over the past several years has been the dramatic reduction in biomass evident in the New Jersey inshore area, and off the coast of the Delmarva peninsula. The loss of the biomass in the southern end of the species range was identified in the 2003 SARC and was the impetus for a NEFSC and industry sponsored research effort in the summer of 2004 (USDC 2005). This joint survey (only on the portion of the surfclam resource south of Hudson Canyon) documented the large decline in the portion of the resource off of Delmarva (DMV) but found more biomass off northern New Jersey (NNJ) than was estimated from the 2002 NEFSC survey. In fact, the

2004 survey indicated that the biomass level in NNJ was similar to what was found there by the 1997 and 1999 surveys. Strong recruitment occurred recently in the two NNJ mid-depth strata, but not in shallower strata of NNJ or DMV (USDC 2005).

Recruitment has been below average since 1999 (Appendix 1). The last strong year classes on GBK, NJ, and DMV occurred in 1999, 1992, and 1993 respectively. The full assessment report describes factors that may have reduced recent recruitments in the DMV and NJ regions.

The surfclam stock biomass is declining from record-high levels during the late 1990s toward lower levels similar to the early 1980s. High biomass during the late 1990s was due to relatively high recruitment and relatively fast growth rates in the southern region. Fishable biomass in 2008 was 1.93 billion pounds of meats, which has declined about 3% per year since the late 1990s.

The decline is surfclam biomass since the late 1990s can be explained by negative surplus production caused by lower recruitment and slower growth rates in the NJ and DMV regions. The fishery appears to have been a secondary factor. When surplus production is negative, stock biomass will decline, even when no fishing occurs. When fishing occurs, stock biomass will further decline whenever catch exceeds surplus production.

Regions with the highest fishable biomass shifted from the south to the north during 1982-2008 (Appendix 1). During 1982, Delmarva held the largest fraction of fishable surfclam biomass. The fraction of total biomass in Delmarva increased through the late-1980s and then declined to the current relatively low level. New Jersey held the largest share of surfclam biomass during 1994-2002. During 2008, the largest share of surfclam biomass was in the Georges Bank area due to declining biomass in DMV and NJ. This has been a huge change where in 1986 DMV and SVA (Southern Virginia) had 55% of the biomass and now in 2008 only has 5% while Georges Bank in 1986 had 5% and now has 48%. New Jersey has maintained its share of the biomass in that it had 32% in 1986 and 22 years later it still has 30%.

The SARC summary (USDC 2009b) produces projections and provides decision table analyses (Appendix 1). Biological reference points for biomass and fishing mortality were required by the Sustainable Fisheries Act (SFA) of 1996 and proposed by the Council in 1999 under Amendment 12 (MAFMC 1999). The 1999 reference points for biomass were rejected by the Agency because they were for the New Jersey portion of the resource only. New and approved biomass reference targets and thresholds for the entire surfclam resource were the focus of Amendment 13 (MAFMC 2003 and identified in Table 4).

This quota recommendation paper is for 2012 and 2013 only. Amendment 13 allowed the Council to set multi-year quotas for three years based on a new survey and assessment every three years. There is a desire, with the *RV Delaware II* being decommissioned soon to move the survey to an industry platform. Initially, that could have delayed the completion of a new assessment in 2012. The plan now is do conduct one more survey in the summer of 2011 on the *Delaware II* and maintain the three year schedule. MAFMC staff was anticipating a potential delay and requested five year projections and thus the reason that projections are run through 2015 rather than simply three years through 2013.

Forecast results (USDC 2009b) indicate that surfclam biomass will continue to decline slowly through 2015. In all cases, this occurs because surplus production has been negative and is likely to remain negative due to poor recruitment and slow growth in the more southern regions.

Fishing mortality at the proxy for MSY times the current biomass would yield a catch of 251.3 million pounds of meats (14.8 million bushels, Table on page 13 of Appendix 1). Surfclams were overfished in the mid-1970s (prior to management) when 75 to 100 million pounds of meats were landed for a couple of years. The Council has a specified OY range in the FMP (since the early 1980s) of 31.5 to 57.8 million pounds (1.85 to 3.4 million bushels). A plan Amendment would be required to change this OY range.

The probability of overfishing and overfished status for this stock appears low under all of the states of nature considered (Appendix 1 Table A1). Projections for decision analysis included three values for natural mortality (low (0.1), medium (0.15) and high (0.2) levels) and three survey dredge catchabilities as "states of nature".

II. C. The New Jersey Inshore Resource and Fishery

The surfclam resource within New Jersey State waters is the most closely monitored of any on the East Coast. State officials estimate the biomass declined from 17.4 million bushels in 1997 to 1.97 million bushels in 2010. The New Jersey quota was reduced from 700,000 bushels in the 2001/2002 season to 275,000 bushels in the 2003/2004 and had been reduced to the 10% minimum biomass figure of 198,000 bushels for 2007/2008. The quota for 2008/2009 was set at a very conservative level of 58,368 bushels while the 2009/2010 quota was reduced even further to 55,296 bushels and kept at that level for 2010/2011. Fishermen have been unable to harvest even these reduced amounts, and in the previous seven fishing seasons the fishery has been virtually non-existent (Table 5).

New Jersey conducts a survey nearly every summer and produces a surfclam resource report every three to five years. The total surfclam standing stock for New Jersey territorial waters from Shark River Inlet to Cape May in the summer of 2010 was 1.97 million bushels. Survey work in 2011 will be completed in August (Normant pers comm). Annually, the state surveys about 330 stations. The overall length-frequency distribution of the surfclam resource has not changed dramatically, but the mean shell lengths have been steadily increasing since 1993. The mean shell length of surfclams found in 1993 was 3.9 inches and has steadily increased to a mean shell length of 5.6 inches in 2010. The number of clams per bushel has also decreased (from the increase in the mean size) from 202 clams per bushel in 1995 to 84 clams per bushel in 2010. This points out that while the volume (biomass) is down, the actual number of individuals is down even further. The most notable difference recently has been the lack of clams collected that were less than 2.7 inches in the last several years. Prior to the 2010 survey, the previous ten surveys had a combined total of less than 450 clams collected that were less than the 2.7 inches, whereas during the early to mid-1990s there were thousands of small clams collected in each individual survey (Normant pers comm). During the 2010 survey, there were 292 clams smaller than 2.7 inches collected.

New Jersey establishes an annual quota for its inshore surfclam fishery with a minimum constraint that the quota cannot exceed 10% of the estimated standing stock or a maximum of a million bushels. A constant annual quota of 600,000 bushels had been maintained for years until the 1999/2000 season. New Jersey is unique in defining a season which begins in October of one calendar year and closes at the end of May in the next.

The quota was increased to 700,000 bushels for the 1999/2000 season based on the very high biomass estimated from the 1999 survey. With the lack of recruitment, the State of New Jersey lowered the quota back to 600,000 bushels for the 2002/2003 season. The quota has been reduced pretty consistently during the past decade.

Table 5. New Jersey Surfclam Quotas and Landings (Bushels).

Season (Oct - May)	Quota (bu)	Landings (bu)	Bushels Unharvested	Percent Unharvested
FY 95/96	600,000	566,120	33,880	5.6%
FY 96/97	600,000	468,377	131,623	21.9%
FY 97/98	600,000	467,569	132,431	22.1%
FY 98/99	600,000	570,852	29,148	4.9%
FY 99/00	700,000	699,649	351	0.05%
FY 00/01	700.000	700,256	(256)	(0.04%)
FY 01/02	700,000	702,257	(2,257)	(0.3%)
FY 02/03	600,000	601,056	(1,056)	(0.2%)
FY 03/04	275,000	197,152	77,848	28.3%
FY 04/05	350,000	60,600	289,400	82.7%
FY 05/06	237,000	480	236,520	99.8%
FY 06/07	240,000	448	239,552	99.8%
FY 07/08	198,000	0	198,000	100%
FY 08/09	58,368	0	58,368	100%
FY 09/10	55,296	1,852	53,444	96.6%
FY 10/11*	55,296	0	---	---

* Landings for 2010/2011 not final.

Source: New Jersey Division of Fish and Wildlife

Stock biomass continued to decline, obliging the State to dramatically cut the quota for 2003/2004 to only 275,000 bushels. The industry found the sparse beds uneconomical to fish, and left 28% of the quota unharvested. Harvests have continued to decline every year since, and in the 2005/2006 season, the 2006/2007 season, the 2007/2008 season and the 2008/2009season, the commercial fishery was virtually shut down. Though the State published a quota of 237,000 bushels (2005/2006) and a quota of 240,000 (2006/2007), a mere 480 bushels was taken in late January of 2006 and even less (448) in 2007. No landings occurred between October 2007 and mid-May 2008. No landings were reported for 2008/2009 and the quota was a mere 58,368 bushels. During 2009/2010 there were 1,852 bushels landed of the 55,296 bushel quota. No landings have occurred during this fishing year through mid-May.

There is a limited (around 50,000 bushels/year) surfclam "bait" fishery that occurs in contaminated waters of northern New Jersey. In 2010 there were 26,193 bushels of "bait" landed.

There are 54 licenses for the inshore New Jersey surfclam fishery. Up to three licenses can be combined onto one vessel. Each license receives an equal share of the annual quota, and those fishermen can fish their quota whenever it is appropriate for them to fish.

II. D. The New York Inshore Fishery for Surfclams

New York inshore waters are divided into two segments: Long Island Sound and the Atlantic Ocean. The annual harvest limit for Long Island Sound is 50,000 bushels. Landings greatly increased in 2003, to 57,000 bushels and the fishery was closed in May of that year. In 2004, nearly 63,000 bushels were taken before the fishery was closed in March. In 2005 the market for surfclams from Long Island Sound dropped; only 45,000 bushels were taken, and by 2006 only 448 bushels were harvested. Harvests in 2007 were 705 bushels, and then increased in 2008 to 3,798 bushels. In 2009, 5,317 bushels harvested from Long Island Sound, but no landings occurred in 2010 (Dahl pers comm). Most of the harvest from New York State waters is from the Atlantic Ocean.

The average catch from New York waters was approximately 173,000 bushels annually for the 20-year period spanning the 1970s and 1980s. Catches soared in 1990 with implementation of ITQ management in the federal fishery, as surplus vessels from the federal fishery sought alternative areas to fish.

Harvests peaked in 1993 at just over 850,000 bushels, then trended downward through 1998, when the market for surfclams began shrinking in the mid-1990s and the black, lower-yielding resource from New York's State waters was less desirable. From 1999 through 2004, landings increased steadily and reached a maximum of 883,000 bushels in 2004. The market again began to shrink and landings fell to 489,046 in 2005 and then to only 407,254 bushels in 2006. This downward trend in landings is evident for 2007, 2008, 2009, and 2010 as well, with 376,510 bushels, 347,612 bushels, 294,921bushels, and 193,152 bushels harvested, respectively (Table 6).

Landings have been typically restricted by a vessel limit of 21 cages per week prior to 2010. At times the weekly limit had been reduced to 14 cages to prevent landings from exceeding the quarterly and annual harvest limits. In the first quarter of 2003, boats were allowed 21 cages initially, but as it became apparent that landings would exceed the quarterly limit, they were reduced to 14 cages per boat per week. In 2004, with the nearly doubling of the annual harvest limit, boats were allowed to catch 28 cages per week. In 2005 boats were allowed to catch 21 cages per week for the first quarter and were then reduced to 14 cages per week for the remainder of the year. The weekly harvest limit continued at 14 cages for the first three quarters of 2006, and then increased to 21 cages for the last few weeks of the year. In 2007 the harvest limit remained at 14 cages per week for the entire year, except for the last few weeks of the year when the limit was again increased to 21 cages (Davidson pers comm). The 14 cage limit was re-instated early in 2008 and remained at this limit to 2010 (Dahl pers comm).

An Individual Fishing Quota (IFQ) system went into effect in 2010. The annual harvest limit for 2010 was 300,000 bushels for the Atlantic Ocean surfclam fishery. Based on 22 eligible vessels, each vessel was assigned an IFQ of 13,636 bushels. There were no weekly or monthly limits, just a 28 cage daily limit. During 2010, 16 permitted vessels reported surfclams landed from the Atlantic Ocean waters of New York State, for a total of 193,152 bushels. No surfclams were harvested outside of the Atlantic Ocean waters in 2010.

Surfclam population assessment surveys are conducted by DEC personnel on board a chartered commercial fishing vessel. The 1996 survey estimated that there were 12.2 million bushels (Table 7) of surfclams in the 180 square nautical mile area that is New York's State waters in the territorial sea (Davidson pers comm). The 1999 survey showed a slight increase to 12.8 million bushels. The 2002 population estimate for New York state waters of the Atlantic Ocean was 18.6 million bushels of surfclams. Further analysis of the data showed an estimated population of 3.3 billion individual clams.

Table 6. New York Surfclam Quotas and Landings (Bushels).			
Year	Quota (bu)	Harvest (bu)	Percent Over or Under Quota
1990	(none)	720,473	
1991	(none)	713,019	
1992	(none)	719,351	
1993	(none)	856,366	
1994	500,000	494,489	1.1% under
1995	500,000	410,137	18.0% under
1996	500,000	447,780	10.4% under
1997	500,000	388,829	22.2% under
1998	500,000	233,902	53.2% under
1999	500,000	269,867	46.0% under
2000	500,000	339,142	32.2% under
2001	500,000	443,859	11.2% under
2002	500,000	501,290	0.3% over
2003	500,000	494,051	1.2% under
2004	930,000	882,969	5.1% under
2005	500,000	489,046	2.2% under
2006	500,000	407,254	18.5% under
2007	400,000	376,510	5.9% under
2008	400,000	347,612	13.1% under
2009	300,000	294,921	1.7% under
2010	300,000	193,152	35.6% under
Source: NYS Dept. of Environmental Conservation			

The 2005 population estimate was 10.1 million bushels, a startling 46% decline from the 2002 survey estimate. This result is also reflected in the drop in the estimated number of individual clams to 1.1 billion. In the face of the 2005 results, DEC decided to keep the annual harvest limit at 500,000 bushels for 2006 and to conduct another survey during the summer of 2006. The results of that survey showed that the population had again declined, although not statistically significantly, to 9.5 million bushels, or approximately 1 billion individual clams. The proportion of clams smaller than the legal size limit of 4 inches (101 mm) has also declined in past years, from approximately 34% in 2002 to 1.7% in 2006. This indicates a large decline in recruitment of the resource. In light of the declining population and recruitment, the 2009 and 2010 annual harvest limit was set at 300,000 bushels (Dahl pers comm).

Table 7. New York Surfclam Population Estimates in the Territorial Sea	
Year	Bushels
1996	12.2 million
1999	12.8 million
2002	18.6 million
2005	10.1 million
2006	9.5 million
2008	6.8 million

The most recent population assessment survey was completed in 2008 and revealed that the status of the surfclam resource is not improving. In fact, population biomass has decreased by 28% since the 2006 survey. In terms of individual clams, numbers have dwindled to 780 million, representing a 26% decline since the last survey in 2006. Though these data present a bleak outlook on the overall status of New York's surfclam population, and its ability to support a sustainable fishery, a ten-fold increase in the overall percentage of seed clams offers some hope for the future. While the percentage of the population consisting of sub-legal surfclams under 4 inches shell length was reported at 1.9% and 1.7% for the 2005 and 2006 surveys, respectively, the 2008 survey results indicate these young clams accounted for 10.3% of the population – an indication of some improvement in recruitment. There are plans to conduct a survey of New York waters during the summer of 2011 (Dahl pers comm).

In 2003 there were 19 vessels participating in the fishery, followed by 20 in 2004. In both 2005 and 2006 the total increased to 22 vessels. In 2007 and 2008 less than 20 vessels were active, and that has continued to be the case where only 15 vessels fished in 2009. At the start of 2010 the New York State government moved this fishery to an IFQ system where 22 vessels qualified and 16 vessels landed surfclams in 2010.

New York State continues to operate a limited surfclam fishery for bait from a specific area off the Rockaways.

II. E. Fisheries in the EEZ

II. E. 1. Recent Industry Events

In May 2008 the Mappsville plant ceased operations altogether, and moved the processing work to other Sea Watch plants in Easton, Maryland and Milford, Delaware (Vaughn 2008).

Major users of clam meats have reduced their purchases from industry and stopped advertising products like clam chowder in the media. Industry members reported that imported meat from Canada and Vietnam contributed to an oversupply of clam meats in the marketplace. The costs to vessels harvesting clams have increased significantly, with the greatest component the cost of diesel fuel. Trips harvesting surfclams have also increased in length as catch rates have declined steadily.

All of these factors have resulted in clam-related businesses becoming less profitable in recent years. In 2004 there were 50 vessels participating in the surfclam and ocean quahog fisheries apart from Maine. In 2010 there were 43 vessels operating in these fisheries. Consolidation and concentration in the industry has grown as the businesses in the strongest financial condition assimilate those in weaker position.

II. E. 2 The Federal Surfclam Fishery

- In 2010 the industry reported harvesting a total of 2.352 million bushels of surfclams based on vessel logbook reports, a decrease of 9.9% from the prior year. Contributing factors likely include the soaring price of fuel in recent years, the economic downturn, and falling catch rates.

- Industry has experienced difficulty utilizing increases in both the federal surfclam and ocean quahog quotas that were implemented in 2004. In 2010 the unharvested portion of the surfclam quota equaled 31% of the 3.4 million bushel total.

- The most worrisome trend in the surfclam fishery continues to be the decline in the productivity of effort. The average number of bushels harvested in an hour of fishing is an important indicator of both the abundance of clams in the beds being fished, as well as the costs of fishing operations. Increase in fishing time from working on sparser beds translates directly into higher fuel costs.

- A fleet-wide calculation of surfclam Landings Per Unit of Effort (LPUE) has declined by an average of almost 10% each year between 2000 and 2010, from 129 to 48 bushels per hour (Appendix Table 1 and Appendix Figure 1). Appendix Figure 1 illustrates the decline as almost a straight line.

- The increased costs associated with longer fishing trips are magnified by the fuel price increases of the past several years. Industry members have mentioned that clam vessels operating hydraulic dredges have the additional expense of supplying fuel to the dredge pump engine.

- The need to maintain product freshness places an upper bound on how long vessels may remain at sea. In 2010 the average trip took 35.8 hours dock-to-dock; an increase of 2.9% over the prior year.

- The average ex-vessel price of a bushel of surfclams decreased $0.13 to $11.83 in 2010. The total ex-vessel value of the 2010 federal harvest was approximately $25.9 million, down 14.2% from 2009. [Note that price and value statistics presented in this document are those reported by industry processors and dealers. Prior documents relied on values reported by vessels.]

- Unlike the ocean quahog fishery, the surfclam fishery has been unable to find large, dense beds of high-yield surfclams to replace those that have been the mainstay of the fleet for many years. The high catch rates that were reported off eastern Nantucket Island have dropped substantially from the 200+ bushels per hour experienced when the dense beds were first discovered in 2004. The industry continues to depend most heavily on a single degree square off New Jersey: # 3973. It supplied 39% of the 2010 federal harvest, down from 55% in 2009 (Appendix Table 3). Average catch rates in that square declined 18% in 2010, from 54 to 44 bushels per hour.

- A modest fishery for surfclams does persist at the southern end of its range, in the deeper waters off the coast of Maryland and Virginia. Degree square 3874 supplied 13% of the 2010 harvest at approximately 304,000 bushels (Appendix Table 3).

Table 8. Federal Surfclam & Ocean Quahog Quotas and Landings: 1979 - 2011.

Surfclams (Thousand Bushels)			
* Georges Bank first closed for PSP in 1990			
Year	**Landings**	**Quota**	**% Harvested**
1979	1,674	1,800	93%
1980	1,924	1,825	105%
1981	1,976	1,825	108%
1982	2,003	2,400	83%
1983	2,412	2,450	98%
1984	2,967	2,750	108%
1985	2,909	3,150	92%
1986	3,181	3,225	99%
1987	2,820	3,120	90%
1988	3,032	3,385	90%
1989	2,838	3,266	87%
1990*	3,114	2,850	109%
1991	2,673	2,850	94%
1992	2,812	2,850	99%
1993	2,835	2,850	99%
1994	2,847	2,850	100%
1995	2,545	2,565	99%
1996	2,569	2,565	100%
1997	2,414	2,565	94%
1998	2,365	2,565	92%
1999	2,538	2,565	99%
2000	2,561	2,565	100%
2001	2,855	2,850	100%
2002	3,113	3,135	99%
2003	3,244	3,250	100%
2004	3,138	3,400	92%
2005	2,744	3,400	81%
2006	3,057	3,400	90%
2007	3,231	3,400	95%
2008	2,920	3,400	86%
2009	2,613	3,400	77%
2010	2,352	3,400	69%
2011	n/a	3,400	---

Ocean Quahogs (Thousand Bushels)			
* Maine ocean quahog fishery excluded starting in 1991			
Year	**Landings**	**Quota**	**% Harvested**
1979	3,035	3,000	101%
1980	2,962	3,500	85%
1981	2,888	4,000	72%
1982	3,241	4,000	81%
1983	3,216	4,000	80%
1984	3,963	4,000	99%
1985	4,570	4,900	93%
1986	4,167	6,000	69%
1987	4,743	6,000	79%
1988	4,469	6,000	74%
1989	4,930	5,200	95%
1990	4,622	5,300	87%
1991*	4,840	5,300	91%
1992	4,939	5,300	93%
1993	4,812	5,400	89%
1994	4,611	5,400	85%
1995	4,628	4,900	94%
1996	4,391	4,450	99%
1997	4,279	4,317	99%
1998	3,897	4,000	97%
1999	3,770	4,500	84%
2000	3,161	4,500	70%
2001	3,691	4,500	82%
2002	3,871	4,500	86%
2003	4,069	4,500	90%
2004	3,823	5,000	77%
2005	2,940	5,333	55%
2006	3,066	5,333	57%
2007	3,366	5,333	63%
2008	3,426	5,333	64%
2009	3,443	5,333	65%
2010	3,550	5,333	67%
2011	n/a	5,333	---

Source: NMFS Clam Vessel Logbook Reports, Woods Hole, MA

III. Ocean Quahog Resource and Fisheries

III. A. Ocean Quahog Life History and Distribution

Ocean quahogs are found in the colder, deeper waters of the shelf on both sides of the North Atlantic. Off the United States and Canada, they range from Newfoundland to Cape Hatteras at depths from 25 feet to 750 feet. As one progresses northward, ocean quahogs inhabit waters closer to shore, such that the State of Maine has a small commercial fishery which includes beds within the State's Territorial Sea, however these beds are as deep as 300 feet.

Ocean quahogs are one of the longest-living, slowest growing marine bivalves in the world. Under normal circumstances, they live to more than 100 years old. Ocean quahogs have been aged in excess of 200 years. They require roughly twenty years to grow to the sizes currently harvested by the industry (approximately 3 inches), and reach sexual maturity between ages 5 and 15.

III. B. Stock Status

The ocean quahog stock in the US EEZ is not overfished and overfishing is not occurring (USDC 2009a and Appendix 2). Estimated fishable stock biomass during 2008 (survey year) was 6.4 billion pounds of meats, which is above the management target of ½ the virgin (1978 pre-fishery) biomass level of 3.9 billion pounds of meats (Table 4). Estimated fishing mortality during 2008 for the exploited region (all areas except Georges Bank) was 0.010, which is significantly below the current approved management threshold of 0.05 (MAFMC 1999) and still less than half the SARC (USDC 2009a) recommended and Council approved definition proposed for Amendment 15 that is under development. These estimates for ocean quahogs in the US EEZ do not include Maine waters, which were assessed separately. However, biomass and landings for Maine waters are minor and would have no appreciable effect on estimates for the whole stock (Appendix 2).

Mean annual recruitment to the whole stock was small (less than 1% per year). A pulse of recruitment in Long Island has finished growing to fishable size, based on survey data collected during 2008. Survey size frequency data in 2008 indicate an increasing number of pre-recruits in parts of Southern New England and GBK. Recruitment of these individuals to the fishable stock is expected to occur over the next decade.

The fishable stock biomass in 2008 was 6.4 billion pounds of meats (Appendix 2). Estimated virgin biomass in 1978 was 7.9 billion pounds of meats. The ocean quahog population is a relatively unproductive stock that is being fished down from its virgin state towards the B_{MSY} reference point. After several decades of relatively low fishing mortality, the stock is still at 81% of the pre-fishing level.

Based on NEFSC survey data, LPUE data and biomass estimates for 1977-2008, declines in stock biomass are most pronounced in southern regions. In particular, stock biomass is below the one-half virgin level in the Southern Virginia, Delmarva, and New Jersey regions (Appendix 2).

An increasingly large fraction of the stock (84% during 2008 compared to 67% during 1978) now occurs in the northern regions (Long Island, Southern New England, and Georges Bank). The Georges Bank region is of particular importance because it contained 33% of total biomass in 1978 and 45% of total biomass in 2008. Georges Bank has been closed to fishing since 1990 because of PSP, but may be opened to fishing in the near future.

The SARC summary (USDC 2009a) produces projections and provides decision table analyses (Appendix 2). Biological reference points for biomass and fishing mortality were required by the SFA of 1996 and proposed by the Council in 1999 under Amendment 12 (MAFMC 1999) and approved by the Secretary (Table 4). New, more conservative biological reference points were recommended by the 2009 SARC for biomass threshold, fishing mortality threshold, and fishing mortality target (Table 4). These proposed reference points were endorsed by the FMAT in August 2009 and approved by the Council (October 2009) for inclusion in Amendment 15.

Based on a review of F_{MSY} reference points of long-lived West Coast groundfish species the 2009 SARC recommended $F_{threshold}$ as $F_{45\%} = 0.0219$. The new SARC recommended biomass threshold of 3.2 billion pounds of meats is 40% of the 1978 pre-fishery biomass. This recommended biomass threshold is *ad hoc*, but it is probably better than the current biomass reference point both in relation to $F_{45\%}$ and in maintaining a productive stock for the long term (Appendix 2).

This quota recommendation paper is for 2012 and 2013 only. Amendment 13 allowed the Council to set multi-year quotas for three years based on a new survey and assessment every three years. There is a desire, with the *RV Delaware II* being decommissioned soon to move the survey to an industry platform. Initially, that could have delayed the completion of a new assessment in 2012. The desired plan now is do conduct one more survey in 2011 on the *Delaware II* and maintain the three year schedule. MAFMC staff was anticipating a potential delay and requested five year projections and that is why projections are run through 2015 rather than simply three years through 2013.

Projection results indicate that overfished (low biomass) stock conditions are not likely to occur by 2015 under any of the states of nature or management policies considered in projections. Overfishing (F too high) is unlikely to occur in 2015 at status-quo or at the current FMP OY minimum (Appendix 2). However, there is some probability of overfishing in 2015 for landings as high as the current quota or the maximum OY allowed by the FMP if the F is calculated for just the "exploited" stock. The Amendment 12 (MAFMC 1999) argued that the fishing mortality reference points should be compared to only the proportion of the stock that is exploitable and not the biomass that is not available due to area closures (i.e., Georges Bank). The Regional Office considered opening Georges Bank in 2010, but received limited negative comments about the need for mandatory PSP testing protocol. The Council voted in February 2011 that the addition of a PSP testing protocol should be added to Amendment 15. Should Georges Bank be available to fishing, the entire biomass will then be used as a comparison for the reference points which will bring in the 45% of the resource that is on Georges Bank. There is then no probability of overfishing for the entire stock even at the maximum level of 6 million bushels allowed by the FMP.

The $F_{45\%}$ recommended new threshold times the current biomass would yield a catch of 140.5 million pounds of meats (14.0 million bushels, Table B1 of Appendix 2). Ocean quahogs have never been overfished since the inception of the fishery in the late 1970s. The Council has a specified OY range in the FMP (since the early 1980s) of 40.0 to 60.0 million pounds (4 to 6 million bushels). A plan Amendment would be required to change this OY range.

The probability of overfishing and overfished status for this stock appears low under all of the range of catches allowed by the FMP and states of nature considered (Table B27 stock assessment). Projections for decision table analysis included three values for natural mortality (low (0.015), medium (0.020) and high (0.025) levels).

III. C. Maine Resource and Fishery

Landings, surveys carried out by the State of Maine, and survey dredge efficiency estimates were used to estimate biomass and fishing mortality of ocean quahogs in Maine waters during 2005 through 2008. The estimates for Maine apply only to the area surveyed, which includes the primary fishing grounds.

In 2005 and 2008 Maine conducted its own stock assessment, complete with dredge efficiency estimates, which was peer-reviewed as part of the ocean quahog SARC (Appendix 2). The majority of the following two paragraphs come from that peer-review.

There are two principal fishing grounds for ocean quahogs in Maine waters, the east bed and the west bed, which together cover about 60 nautical square miles. Landings peaked in 2002 at nearly 129,000 bushels and then declined in the following years until rebounding in 2006 (Appendix Table 2). The most productive eastern fishing grounds were reopened by the State of Maine in late 2005 after three years of closure due to PSP contamination.

Fishing effort in Maine waters peaked during 2004 at about 19,000 hours per year and then declined to about 11,000 hours in 2008. Ocean quahogs harvested from Maine waters are small in size compared to those harvested in the EEZ. Ocean quahogs in the Maine fishery range from 1.4 to 2.8 inches, and are marketed in the fresh and half-shell market at relatively high prices.

The small-scale fishery for ocean quahogs in Maine provides a stark contrast to the industrial fishery that occurs off the coast of the mid-Atlantic. Small vessels in the 35-45 foot range actively target smaller ocean quahogs for the fresh, half shell market in Maine. Most of the catch is trucked directly out of Maine and brings an ex-vessel price that ranges from $25 - $40 per Maine bushel.

Fishable biomass in Maine waters in 2005 was estimated to be 36.5 million pounds or 3.3 million Maine bushels. The Maine fishery is small, relative to the rest of the EEZ. In particular, the Maine fishery exploits relatively small ocean quahogs at a rate where F = 0.02. That fishing mortality is more than double that on the remainder of the exploitable stock.

In 2010 the Maine ocean quahog fleet harvested a total of 56,406 Maine bushels, a <1% increase from the 56,344 bushels harvested in 2009 (Appendix Table 2). Of the total 2010 harvest, 49,262 bushels were taken from the 100,000 bushel quota for Maine, and 7,144 bushels were leased from the industrial ITQ fishery. Average catch rates have declined from a recent peak of 8.1 bushels per hour in 2006 to 5.8 bushels in 2010. In early 2011 the average increased to over 6 bushels per hour.

Finally, average prices have declined substantially over the past 5 years. In 2003 there were very few trips that sold for less than $37.00 per Maine bushel, and the mean price was $40.66. Aggressive price cutting by one company has driven prices down such that many trips in 2008 and 2009 sold for $28.00, with the mean price for all trips equaling $33.31 per bushel in 2008. With fuel prices soaring in mid-2008, the number of vessels participating in the fishery fell to a total of 22 vessels. In 2010, the mean price was $32.20 per Maine bushel and a total of 15 vessels participated in the fishery; the lowest level of vessels on record in the current data series extending back to 1991.

The value of the 2010 harvest reported by the purchasing dealers totaled $1.913 million, a drop of <1% from the prior year.

The Maine ocean quahog quota has been 100,000 bushels since implementation of Amendment 10 in 1999.

III. D. Fisheries

- Landings of ocean quahogs totaled 3.550 million bushels in 2010 based on vessel logbook reports, an increase of 3% over 2009. The 2005 harvest of 2.940 million bushels was the lowest level experienced in the past 24 years. The ocean quahog fishery has been affected by the same market forces that reduced the harvests of surfclams, however the impact was more severe because their value is roughly half that of surfclams.

- Landings had been on a declining trend from 1992 to the year 2000, when the harvest of ocean quahogs was at its lowest level in two decades. Fully 30% of the 2000 federal quota was left unharvested, as declining catch rates and higher fuel prices had reduced the profitability of harvesting ocean quahogs.

- In 2001 new life was breathed into the ocean quahog fishery, sparked by a sharp increase in ex-vessel prices and the improved efficiency of large, newly constructed vessels. Landings jumped approximately 17%, followed by a 5% increase in both 2002 and 2003.

- In 2004 the ocean quahog fishery started into another decline as the effects of the coming glut in the market for clam meats started to be felt. As mentioned previously, industry elected to reduce production of the lower-valued ocean quahogs first, and followed with surfclam production cutbacks only when it became clear there was no other choice.

- In 2005 the impacts of the crisis were most strongly felt. The federal quota had been newly increased to 5.333 million bushels, however at year's end, 45% had been left unharvested on the ocean floor. This was the largest percentage surplus on record, going back as far as 1979 when vessel logbook data started becoming comprehensive.

- A total of 21 vessels participated in the ocean quahog fishery in 2010, an increase of six vessels from 2009, but below the 29 vessels that participated in 2004.

- Of the 5.333 million bushel quota for 2010, 7,144 bushels were leased to the Maine fishery, and 3.550 million harvested by the industrial fishery outside of Maine.

- The average ex-vessel price of ocean quahogs reported by processors increased a modest 1.9% from $6.76 to $6.89 per bushel in 2010. The total ex-vessel value of the 2010 federal harvest outside of Maine was approximately $23.8 million or 4.8% increase from the prior year.

- Fleet performance statistics suggest that production continues to shift to large vessels fishing longer trips. For example, the average number of ocean quahog trips taken per vessel in 2010 declined from 75 to 56 trips. However the average number of hours captains reported fishing on each trip slightly increased over 4%, from 22 hours to 23. The average number of bushels harvested per trip slightly decreased from approximately 95 cages to 94. (Each cage holds 32 bushels.)

- A fleet-wide calculation of LPUE showed that the average number of bushels harvested per hour of fishing decreased from 141 in 2009 to 133 in 2010 (Appendix Table 2). In early 2011 the average was 127 (Appendix Figure 2).

- Examination of ocean quahog LPUE over the past 20 years looks something like a roller coaster ride, with many peaks and valleys (Appendix Figure 2). Each 'hill' illustrates the pattern of improving productivity as the fleet moves to a new area of virgin biomass, and each valley the decline in productivity as that area is fished down.

- Harvests of ocean quahogs remained concentrated on the high-yielding degree square off eastern Long Island (4072). Fully 74% of the coastwide harvest was taken from this square in 2006. In 2009 and 2010 the percentage had decreased to 45 and 53% of the total harvest, respectively. The next most heavily fished areas are the adjacent squares to the east (4071) and southwest off New Jersey (3973) - (Appendix Table 4 and Appendix Figure 4).

- Obtaining the highest catch rate can require traveling a substantial distance offshore, as evidenced by the darkest-colored squares on a map of ocean quahog catch rates by ten-minute square (Appendix Figure 4). Limits on further movement of the fleet to the east were imposed by the closure of surfclam and ocean quahog beds east of the 69° line since 1990, due to the presence of PSP toxin.

- Some fishing for ocean quahogs does persist in the southern waters off Delmarva (3873 and 3874), though catch rates are generally between 50 to 100 bushels per hour. (Appendix Table 4).

IV. Other Relevant Information

IV. A. Paralytic Shellfish Poisoning

During nearly every summer since the Council began managing the Maine ocean quahog resource (1999), some of the principal fishing grounds in Maine have been closed due to the presence of PSP. These closures at times have been important in preventing the quotas from being exceeded because they generally occur when the resource demand is highest. The eastern-most beds between Petit Manan Point and Long Point were reopened in October 2005 (Stockwell pers com) for the first time in three years and contributed greatly to the increase in LPUE at that time. The commercially active Maine beds were sufficiently free of PSP to remain completely open for all of 2006 and in August 2007 there was one short PSP closure that had minimal impact on the fishery. During the past three years, there were no significant closures due to PSP in Maine waters (Couture pers comm). As of May 17, 2011 there were still no PSP found in Maine ocean quahogs (Kleindinst pers comm).

Contamination from PSP has also had a huge impact on the fledgling fisheries for surfclams and ocean quahogs on Georges Bank. These resources were initially closed in 1990 when PSP was found and have remained closed to commercial operations. This area has continued to increase its relative percentage of the biomass for each species and now comprises around 45 percent of both surfclam and ocean quahog total EEZ biomass (Appendices 1 and 2). The amount of resources on Georges Band is very important, as LPUE for surfclams continues to decline in the areas to the west and south of Georges Bank. Both industry and government have been trying to figure a way that these Georges Bank resources can be safely harvested in the future.

The National Ocean Service (NOS) has provided a grant to the Food & Drug Administration (FDA), the States of Maine, New Hampshire, and Massachusetts as well as a clam industry representative to collect water and shellfish samples from federal waters off of southern New England, Gulf of Maine, and Georges Bank. This multi-year project monitors *Alexandrium spp* cell counts in the water column and PSP levels in shellfish along the New England coast and on Georges Bank. Research vessels collect

water samples, along with fish and shellfish taken from the ocean floor. A commercial vessel collects water and shellfish samples from Nantucket Shoals, Stellwagen Bank, and Georges Bank. The FDA designed the sampling protocol and defined the locations where shellfish samples are taken.

The FDA's shellfish PSP Protocol has been revised from its original 1995 requirements to incorporate the latest scientific understanding and technology. The FDA and the Interstate Shellfish Sanitation Commission have ratified the Protocol to be tested in a pilot project. The pilot project was implemented in the spring of 2008. The data from both projects will be used to monitor and better understand the spread of PSP in New England waters.

The Regional Office considered opening Georges Bank in 2010, but received limited negative comments about the need for mandatory PSP testing protocol. The Council voted in February 2011 that the addition of a PSP testing protocol should be added to Amendment 15. Amendment 15 is scheduled for completion in 2012. Until the Regional Administrator has the authority to require the PSP testing protocol the Georges Bank area will likely be open only to vessels involved in the Exempted Fishery.

IV. B. Federal Fleet Profile

As described in other portions of this document, the total number of vessels participating in the surfclam and ocean quahog fisheries outside the State of Maine has experienced a dramatic decline as the fisheries moved beyond a market crisis in 2005. The 50 or so vessels that reported landings during 2004 and 2005 was slashed and coast-wide harvests consolidated on to approximately 40 vessels in the subsequent years. The Maine ocean quahog fleet numbers started to decline substantially in 2006 and totaled 15 in 2010 (Table 9).

Table 9. Federal Fleet Profile, 1996 through 2010.

Non-Maine Vessels	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Harvests BOTH surfclams & ocean quahogs	14	14	8	11	12	14	16	11	14	12	9	9	8	8	12
Harvests only surfclams	20	19	23	22	19	21	23	23	21	24	20	24	24	28	22
Harvests only ocean quahogs	22	17	16	12	17	16	15	16	15	12	9	8	10	7	9
Total Non-Maine Vessels	56	50	47	45	48	51	54	50	50	48	38	41	42	43	43
Maine Ocean Quahog Vessels	25	34	39	38	34	31	35	35	34	32	25	24	22	19	15

Source: NMFS Clam Vessel Logbooks

IV. C. Surfclam & Ocean Quahog Processing Plants

In 2010 there were a total of 8 companies reporting purchases of surfclams or ocean quahogs from the industrial fisheries outside of Maine. Council staff is aware of 10 processing facilities operated by these companies. The following is a list of their names and the species they processed, arrayed from north to south.

<u>Massachusetts</u>
- Blount Seafood (Fall River) Surfclams & ocean quahogs
- Fair Tide Shellfish (New Bedford) Surfclams only; hand-shucked
- Sea Watch (New Bedford) Surfclams & ocean quahogs

(Harbor Blue Seafood (Fairhaven) - Offloading of surfclams only - no processing)

Rhode Island
- Blount Seafood (Warren) Surfclams & ocean quahogs

New Jersey
- Atlantic Capes Fisheries (Point Pleasant Beach) Surfclams only; hand-shucked.
- La Monica Fine Foods (Millville) Surfclams only; hand-shucked
- Surfside Products (Port Norris) Primarily ocean quahogs, some surfclams

Delaware
- Sea Watch (Milford) Surfclams & ocean quahogs

Maryland
- Sea Watch (Easton) - Secondary processing

Virginia
- J H Miles & Company (Norfolk) Surfclams & ocean quahogs

V. Summary

V. A. Ancillary Aspects of the Surfclam and Ocean Quahog Fisheries

There are a number of important aspects of the surfclam and ocean quahog fisheries that distinguish them from most other fisheries in the US, and around the world. In many ways, participants in the clam fisheries are fortunate in their ability to conduct their business operations efficiently and profitably, without many of the complications and liabilities experienced by most other fisheries.

Single Species Fisheries with No Significant Bycatch Industry is able to target both surfclams and ocean quahogs individually, with no significant bycatch of any other species (Wallace and Hoff 2004). This greatly simplifies management and reduces the need for gear restrictions to reduce the harvest of non-target species.

No Interactions with Protected Species The hydraulic dredge is not known to have any impacts on marine mammals, turtles, seabirds or other species protected by law. Nearly all protected resources are able to move faster than a clam dredge which also does not fish in depths where deep water coral would occur.

No Significant Gear Conflicts There have been no reports of gear conflicts in federal waters between clam fishermen utilizing hydraulic dredges and other types of fishing gear, whether mobile or stationary.

Impacts to Essential Fish Habitat (EFH) are Minimal and Temporary The prime habitat of surfclams and ocean quahogs consists of shallow sandy substrates with no vegetation or benthic 'structures' that could be damaged by the passing of a hydraulic dredge. In these 'high energy' environments, it is thought that the recovery time following passage of a clam dredge is relatively short. Additionally, the overall area impacted by the clam fisheries is relatively small (approximately 100 square nautical miles), compared to the large area of high energy sand on the continental shelf. Any impacts to EFH are considered temporary and minimal (Wallace and Hoff 2005).

No Recreational Fisheries There are no recreational fisheries for either Atlantic surfclams or ocean quahogs. Management efforts focus solely on commercial harvests.

ITQ Management Promotes Efficiency and Profitability Managing surfclams and ocean quahogs with tradeable shares of the annual quota has provided industry with greater flexibility and removed incentives for derby fishing. Vessel owners can readily plan to harvest their quota at any time throughout the year. Supply disruptions are eliminated when fishermen are no longer faced with closures imposed to prevent a seasonal, group quota from being exceeded. Profitability and efficiency are dramatically enhanced when unneeded vessels can be sold out of a fishery that has adopted ITQ management (Wallace et al. 2005).

Reduced Enforcement Costs A number of benefits were realized in enforcement following the transition to ITQ management in 1990. Major cost savings resulted when enforcement activity shifted from watching vessels at sea with expensive Coast Guard cutters and aircraft to monitoring clam containers on land (Hoff 2006). Incentives for cheating were drastically reduced once allocation holders were faced with the prospect of forfeiting the allocation for repeated violations. Additionally, the improved efficiency derived from ITQ management has improved the profitability of the clam industry as a whole. Consequently, is it less likely that industry members feel compelled to break the law due to financial stress in their business operations.

V. B. May 2010 SSC Consensus to the ABC Terms of Reference for Surfclams and Ocean Quahogs

B.1. Surfclams

1) The materials considered in reaching its recommendation;

Mid-Atlantic Fishery Management Council. 2010. Overview of the Surfclam and Ocean Quahog Fisheries and Quota Considerations for 2011, 2012, and 2013. Mid-Atlantic Fishery Management Council. 38 p.

Northeast Fisheries Science Center. 2010. 49th Northeast Regional Stock Assessment Workshop (49th SAW) Assessment Summary Report. Ref. Doc. 10-01; 41 p.

Northeast Fisheries Science Center. 2010. 49th Northeast Regional Stock Assessment Workshop (49th SAW) Assessment Report. Ref. Doc. 10-03; 383 p.

SARC 49 panelist reports

Updates on survey indices and landings data

2) The level of catch (in weight) associated with the overfishing limit (OFL) based on the maximum fishing mortality rate threshold;

The F_{MSY} proxy = 0.15 (F=M=0.15). Projected catches at F = F_{MSY} are:

2010	129,300 mt
2011	114,000 mt
2012	102,300 mt
2013	93,400 mt

Catches in 2010 are not expected to be at F_{MSY} levels, however. Thus, available biomass to support catches in 2011-2013 would be expected to be somewhat greater, so these projections may be underestimates.

3) The level of catch (in weight) associated with the acceptable biological catch (ABC) for the stock. The ABC will be selected based on the overfishing definition contained in the FMP and to reflect the level of scientific uncertainty inherent in the stock assessment such that the recommended ABC is less than or equal to the overfishing limit in line with the intent of the Act and the National Standard 1 Guidelines;

Catches at F_{MSY} proxy have a high probability of leading to stock declines below the B_{MSY} proxy target level in 2015, and are projected to lead to high probabilities of overfishing in 2015. Thus, the ABC should be significantly lower than the OFL. The SSC recommends an ABC equal to the catch at 0.75*F_{OFL}*Biomass, based on Restrepo et al. (1998; http://www.nmfs.noaa.gov/sfa/NSGtkgd.pdf):

= 0.75*0.15*878,000 mt
= 0.11*878,000 mt
= **96,600 mt** (includes incidental mortality)

The range of optimum yields (OY) specified in the Fishery Management Plan is between 14,300 and 26,200 mt. The upper value has been used as a quota from 2005-2010.
The stock is currently not overfished, and overfishing is not occurring. However, Delmarva and New Jersey components are well below 50% of the 1999 biomass in the respective regions (= B_{MSY} proxy).

4) If possible, the probability of overfishing associated with catches associated with the OFL and ABC recommendations (if not possible, provide a qualitative evaluation);

See Table A1 from the assessment summary document:

5) The most significant sources of scientific uncertainty associated with determination of OFL and ABC;

Heterogeneity of life history and production parameters over the range of the stock means that model results may be accurate on average, but inaccurate in any particular region (e.g., regional differences in surplus production). This is exacerbated by uncertainty in the distribution of future fishing effort on GB (currently closed to fishing for surfclams) and fact that effort is currently not distributed uniformly.

The use of F=M as an FMSY proxy is not supported by recent apparent negative surplus production: growth and recruitment are insufficient to compensate for natural and fishing mortalities. There is no sustainable yield. Even in the absence of fishing mortality, the stock will not increase, especially in southern areas.

Uncertainty in using F_{MSY} proxy = M (no uncertainty characterization in OFL);

Uncertainty in M (there are no direct estimates of natural mortality);

If surfclams in the George's Bank region are near carrying capacity, then their surplus production could be low;

Survey dredge efficiency is highly variable;

Georges Bank role with respect to recruitment contribution is unclear. It is unavailable to exploitation; and

Projections assumed 1999 biomass = virgin biomass.

6) A certification that the recommendations provided by the SSC represent the best scientific information available.

To the best of the SSC's knowledge, these recommendations are based on the best available scientific information.

Tier specification

Level 3: OFL exists, but no probability distribution of OFL is available. (Approximation of F_{MSY} by M has no probability distribution.)

V. B.2. Ocean Quahog

1) The materials considered in reaching its recommendation;

Mid-Atlantic Fishery Management Council. 2010. Overview of the Surfclam and Ocean Quahog Fisheries and Quota Considerations for 2011, 2012, and 2013. Mid-Atlantic Fishery Management Council. 38p.

Northeast Fisheries Science Center. 2010. 48th Northeast Regional Stock Assessment Workshop (48th SAW) Assessment Summary Report. Ref. Doc. 09-10; 58 p.

Northeast Fisheries Science Center. 2010. 48th Northeast Regional Stock Assessment Workshop (48th SAW) Assessment Report. Ref Doc. 09-15; 834 p.

SARC 48 panelist reports

Updates on survey indices and landings data

2) The level of catch (in weight) associated with the overfishing limit (OFL) based on the maximum fishing mortality rate threshold;

The OFL is based on B_{2008} (exploited area only), and F_{MSY} proxy = $F_{45\%}$ = 0.0219; 2011-2013 OFL = 34,800 mt

3) The level of catch (in weight) associated with the acceptable biological catch (ABC) for the stock. The ABC will be selected based on the overfishing definition contained in the FMP and to reflect the level of scientific uncertainty inherent in the stock assessment such that the recommended ABC is less than or equal to the overfishing limit in line with the intent of the Act and the National Standard 1 Guidelines;

The SSC recommends and ABC for 2011-2013 = 75% F_{MSY} proxy*B_{2008} (exploited area); ABC = **26,100 mt**.

4) If possible, the probability of overfishing associated with catches associated with the OFL and ABC recommendations (if not possible, provide a qualitative evaluation);

Not possible, given available information.

5) The most significant sources of scientific uncertainty associated with determination of OFL and ABC;

Data Uncertainties: The abundance surveys and dredge efficiency estimates are sources of uncertainty. Survey abundance estimates have a quite low coefficient of variation (10 to 21% in 12 survey years), suggesting they are reliable. Data on recruitment is uncertain; there apparently have been some regional recruitment events but these are not well defined. Natural mortality must be low, but there are no estimates. Underlying age structure and growth rate are unknown.

Model Uncertainties: Lacking estimates, proxies for B_{MSY} and F_{MSY}, and associated F reference levels, are adopted. Sensitivity analysis and probabilities of B and F levels are derived from stochastic runs of KLAMZ for assumed M levels. Accurate knowledge of M would reduce uncertainty in the assessment and projections. KLAMZ does not provide explicit threshold or target reference points for ocean quahog.

Stock Status and Reference Points: Trends in stock are well documented, by region and for the total stock. New reference points recommended by SARC 48 are more conservative than previous reference points. Uncertainties in fishing mortality estimates, based on catch data and swept area biomass estimates, were evaluated by region. Confidence intervals on the estimated (modeled) stock biomass are quite high and thus a source of uncertainty. Overall, the stock seems to be in good shape at present, although the long-term prognosis for this unproductive stock is uncertain.

A source of uncertainty is the Georges Bank component of stock that is not now fished, but might be fished in the future. How should it be included in assessments and in evaluation of uncertainty? Fully 45% of the ocean quahog stock is on Georges Bank.

Forecasting: Projections of stock status under different fishing mortality rates and assumed natural mortality rates were conducted to year 2015. Projections in that 5-yr timeframe do not suggest biomass will decline rapidly at present *F* level. But, if fishing mortality increases to the new proposed $F_{threshold}$ level, the projections indicate that overfishing is highly probable at $F_{45\%}$ by 2015. At $F_{present}$ the risk of overfishing is low.

The long-term sustainability of a low-productivity stock like ocean quahog is a source of uncertainty. It is not known if MSY concepts and theory apply to ocean quahog, and whether sustainable fishing is possible under usual circumstances and assumptions. The SSC offers precautionary advice that even (very) low F levels probably not sustainable in the long term, given its life history and associated population dynamics (i.e., slow growing, very longlived, recruitment possibly sporadic). The next SARC should reconsider BRPs (F_{MSY} proxy = $F_{45\%}$ may not be appropriate).

6) A certification that the recommendations provided by the SSC represent the best scientific information available.

To the best of the SSC's knowledge, these recommendations are based on the best available scientific information.

Tier specification

Level 3: OFL exists, but no probability distribution (approximation of F_{MSY} by F45% has no probability distribution).

V. C. Recommendations

The staff recommendation is to maintain the status quo quotas from 2011 for 2012 and 2013. These will be the same quotas that have been in place since the Council was able to provide multi-year quota recommendations in 2005.

The Mid-Atlantic Council is required to review the status of each fishery on an annual basis, but it need not take any action in years two and three if it determines that the existing specifications made for a 3-year quota interval are still appropriate. Tables 10 and 11 provide potential quota alternatives for 2012 and 2013 the Council may wish to consider while performing its annual review in June of 2011.

Table 10. Quota Alternatives for 2012 and 2013 ITQ Fisheries.

Surfclams		
	Description	2012 and 2013 Quota (bu)
Alt. S1	Min. Allowable	1.850 million
Alt. S2	Decrease (12%)	3.000 million
Alt. S3	Slight Decrease (4.4%)	3.250 million
Alt. S4	Max Allowable / Status Quo*	3.400 million
Ocean Quahogs		
	Description	2012 and 2013 Quota (bu)
Alt. Q1	Min. Allowable	4.000 million
Alt. Q2	Slight Decrease	5.000 million
Alt. Q3	Status Quo*	5.333 million
Alt. Q4	Max. Allowable	6.000 million
* Council recommended alternative from June 2010		

Table 11. Quota Alternatives for 2012 and 2013 Maine Ocean Quahog Fishery		
	Description	2012 and 2013 Quota (bu)
Alt. M1	50% of Max. Quota	50,000 Maine
Alt. M2	Slight Decrease	90,000 Maine
Alt. M3*	Max Allowable - Status Quo*	100,000 Maine
* Council recommended alternative from June 2010		

V. C. 1. Surfclam ITQ Quota Considerations for 2012 and 2013

The Council will be in the second year of the three year quota cycle and staff is recommending the status quo. Four potential quota alternatives are considered for the federal surfclam fishery. Alternatives S1 and S4 correspond to the current minimum and maximum allowable quota levels within the FMP of 1.850 and 3.400 million bushels, respectively. Alternatives S2 (3.000 million bushels) and S3 (3.250 million bushels) represent two modest levels of reduction that the Council may consider.

First, catch rates have been declining steadily in the federal surfclam fishery over the past decade on their traditional fishing grounds. Collectively, the fleet has experienced an average drop in LPUE of almost 10% each year since 2000, from 129 to 48 bushels per hour. In early 2011 it had increased to 51 bushels per hour.

Second, substantial declines in surfclam biomass are evident off Delmarva, inshore New Jersey, and most recently off New York. Very few new recruits have been collected in inshore New Jersey. The most frequently mentioned theory to date is increased ocean temperatures that may be impacting the survival of young surfclams and keeping them from later recruiting into the population and the fishery. There is some encouragement recently from the 2008 New York inshore survey that the situation may not be as dire as previously believed. Within the New York survey area there was nearly a tenfold increase in small clams.

The federal EEZ harvest zone is much larger than the inshore waters of New Jersey and New York, and the latest stock assessment indicates that the federal resource is not overfished and overfishing is not occurring. However areas that the industry has depended on for decades are fast approaching a state in which they will no longer be economically profitable to fish. The trend toward greater vertical integration in the clam industry may be of particular importance for the surfclam fishery in the years ahead: harvesting operations that are operating at a loss could at least temporarily be subsidized from profits in the processing arm of the company.

The greatest 'wild card' in the calculation is the status of the Georges Bank resource. Closed since 1990 due to the presence of PSP, the resource there should effectively be in a virgin state. Management officials would certainly wish to encourage industry to take advantage of that resource, which would also serve to take pressure off traditional areas in the mid-Atlantic that are being fished extensively.

As described in earlier sections, the Council in February 2011, decided to add a means for the Regional Administrator to require PSP testing of resources from Georges Bank to Amendment 15.

V. C. 2. Ocean Quahog ITQ Quota Considerations for 2012 and 2013

The Council will be in the second year of the three year quota cycle and staff is recommending the status quo. The staff has identified four alternative ocean quahog quotas for the Council to consider for 2012 and 2013. As with surfclams, the first and last correspond to the minimum and maximum allowable under the current FMP.

Alternative Q3 corresponds to the status quo of 5.333 million bushels.

Alternative Q2 corresponds to a moderate decrease in the quota, and would allow the Council to respond to the large quota surplus that currently exists in the ocean quahog fishery.

At issue with the large quota surpluses is the potential economic impacts of federal quotas that are set in excess of what the industry is able to utilize in an ITQ fishery. Annual quota allocations are distributed to allocation owners each year that rise and fall with the annual quota, with bushel amounts equal to their percentage share of the total quota.

When 100% of the total quota is able to find a market, then all allocation holders will be able to find a buyer for his/her shares. However in years when markets are tight and not all of the quota can be sold, companies which are vertically integrated and have better access to markets may find that the quota allocation they hold is sufficient to fill their orders, and have no need to purchase or lease quota from other holders.

In other words, those companies with greater market access benefit from a reduction in costs because they no longer need to buy the allocation held by others. Correspondingly, those entities left without a market for their allocation suffer a loss in income since their holdings cannot be sold. What is unusual is that in the case of the ocean quahog fishery, there has always been surplus quota. The variable has simply been in how large the surplus is in any given year.

On the surface, raising quota levels in an ITQ fishery that can biologically sustain the increase would appear to benefit all allocation holders equally, since they are all receiving a larger 'piece of the quota pie.' However, large surplus quota could occur.

V. C. 3. Maine Ocean Quahog Quota Considerations for 2012 and 2013

The staff is recommending that the Council leave the current quota of 100,000 Maine bushels in place for 2012 and 2013 as requested by the Maine industry and state representatives.

The Council staff has identified 3 potential quota levels for the Maine ocean quahog fishery. They correspond to the current maximum of 100,000 Maine bushels, a slight reduction to 90,000 bushels, and 50,000 bushels.

V. C. 4. Surfclam Size Limit Suspension

The Council staff is recommending that the current exemption from the minimum size limit on surfclams be maintained for 2012 and 2013 as it has been since implementation of Amendment 8 (MAFMC 1988). Current assessment information indicates that the stock is composed primarily of larger, adult clams in

most areas. Reinstating a minimum size under these conditions would result in greater harm than benefit, as it would require the industry to use "sorting" machines which often damage/destroy undersized clams as it routes them back overboard. In 2010 only an estimated 8.1% of the coast wide commercial surfclam landings were smaller than 4.75 inches. Landings in 2010 from New Jersey had only 7.3% of the clams smaller than 4.75 inches (Hermsen 2010).

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Appendix Table 1. Surfclam Fishery in the EEZ: Number of Vessels, Trips, Hours at Sea, Hours Fishing, Landings (bushels), Landings per Unit Effort (bu/hour fishing), and Average Landings per Vessel

Year	Class	Vessels	Trips	Hours at Sea	Hours Fishing	Surfclam Landings	LPUE*	Ave. Bu. per Boat
1979	1	26	584	9,080	5,787	103,665	17	3,987
	2	61	1,992	39,369	22,670	484,151	21	7,937
	3	75	2,622	59,298	34,326	1,086,393	32	14,485
	All	162	5,198	107,747	62,783	1,674,209	26	10,335
1980	1	14	406	5,674	3,650	79,621	19	5,687
	2	54	2,164	38,743	23,996	597,646	24	11,068
	3	59	2,323	53,098	31,153	1,246,766	40	21,132
	All	127	4,893	97,515	58,799	1,924,033	32	15,150
1981	1	16	328	4,701	2,927	64,942	22	4,059
	2	48	1,502	25,029	14,507	572,063	37	11,918
	3	59	2,198	47,664	23,555	1,339,433	56	22,702
	All	123	4,028	77,394	40,989	1,976,438	47	16,069
1982	1	15	511	7,535	4,908	97,833	20	6,522
	2	47	2,037	32,906	20,916	614,069	28	13,065
	3	53	2,734	55,855	29,721	1,290,928	42	24,357
	All	115	5,282	96,296	55,545	2,002,830	35	17,416
1983	1	14	408	6,323	4,025	113,753	28	8,125
	2	48	2,035	30,354	19,302	818,966	40	17,062
	3	55	2,341	48,934	25,279	1,479,221	58	26,895
	All	117	4,784	85,611	48,606	2,411,940	48	20,615
1984	1	15	319	4,897	3,142	126,421	40	8,428
	2	50	1,763	27,341	16,755	1,152,763	66	23,055
	3	54	1,638	34,893	16,499	1,687,842	96	31,256
	All	119	3,720	67,131	36,396	2,967,026	77	24,933
1985	1	13	217	2,075	1,089	87,791	78	6,753
	2	49	1,307	15,986	7,415	962,313	122	19,639
	3	68	1,582	32,533	11,840	1,859,226	149	27,342
	All	130	3,106	50,594	20,344	2,909,330	135	22,379
1986	1	13	164	1,986	984	81,895	83	6,300
	2	54	1,037	14,679	6,094	964,583	143	17,863
	3	77	1,540	34,724	10,676	2,134,164	189	27,716
	All	144	2,741	51,389	17,754	3,180,642	167	22,088
1987	1	11	159	2,709	1,234	68,006	55	6,182
	2	54	1,143	17,432	7,771	923,127	113	17,095
	3	77	1,433	31,303	8,840	1,828,686	199	23,749
	All	142	2,735	51,444	17,845	2,819,819	151	19,858
1988	1	10	207	3,466	1,895	93,740	49	9,374
	2	51	1,304	19,392	8,743	1,023,364	106	20,066
	3	73	1,527	33,221	9,487	1,914,577	196	26,227
	All	134	3,038	56,079	20,125	3,031,681	143	22,624

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Appendix Table 1. (continued)

Year	Class	Vessels	Trips	Hours at Sea	Hours Fishing	Surfclam Landings	LPUE*	Ave Bu/Boat
1989	1	9	185	3,148	1,904	87,151	44	9,683
	2	50	1,186	15,481	7,357	947,092	117	18,942
	3	76	1,508	26,324	9,610	1,804,165	182	23,739
	All	135	2,879	44,953	18,871	2,838,408	143	21,025
1990	1	8	237	3,931	2,470	69,376	28	8,672
	2	45	1,086	12,450	6,233	961,195	138	21,360
	3	75	1,636	25,067	11,043	2,083,405	184	27,779
	All	128	2,959	41,448	19,746	3,113,976	150	24,328
1991	1&2	25	971	13,853	6,300	808,893	120	32,356
	3	50	1,470	24,942	12,765	1,864,520	144	37,290
	All	75	2,441	38,795	19,065	2,673,413	136	35,646
1992	1&2	19	834	10,682	4,873	738,640	142	38,876
	3	40	1,747	29,874	17,521	2,073,630	117	51,841
	All	59	2,581	40,556	22,394	2,812,270	123	47,666
1993	1&2	17	770	9,294	4,713	778,766	164	45,810
	3	36	1,697	28,538	16,333	2,055,951	126	57,110
	All	53	2,467	37,832	21,046	2,834,717	134	53,485
1994	1&2	15	808	9,778	5,597	826,366	148	55,091
	3	32	1,668	30,844	17,980	2,020,304	112	63,135
	All	47	2,476	40,622	23,577	2,846,670	121	60,567
1995	1&2	13	793	10,800	5,739	810,125	141	62,317
	3	24	1,453	26,169	15,622	1,735,180	111	72,299
	All	37	2,246	36,969	21,361	2,545,305	119	68,792
1996	1&2	12	892	12,821	7,482	958,937	128	79,911
	3	22	1,286	24,570	15,551	1,610,382	104	73,199
	All	34	2,178	37,391	23,033	2,569,319	112	75,568
1997	1&2	11	803	11,509	6,509	837,198	129	76,109
	3	22	1,316	24,643	15,220	1,576,377	104	71,654
	All	33	2,119	36,152	21,729	2,413,575	111	73,139
1998	1&2	11	736	10,558	5,633	764,551	136	69,505
	3	20	1,340	24,810	15,390	1,600,823	104	80,041
	All	31	2,076	35,368	21,023	2,365,374	113	76,302
1999	1&2	10	671	9,857	4,737	766,833	162	76,683
	3	23	1,484	26,019	15,214	1,771,046	116	77,002
	All	33	2,155	35,876	19,951	2,537,879	127	76,905
2000	1	3	57	979	392	15,869	40	5,290
	2	8	743	11,845	6,155	985,248	160	123,156
	3	20	1,241	21,755	13,360	1,559,904	117	77,995
	All	31	2,041	34,579	19,907	2,561,021	129	82,614

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Appendix Table 1. (continued)

Year	Class	Vessels	Trips	Hours at Sea	Hours Fishing	Surfclam Landings	LPUE*	Ave Bu/Boat
2001	1&2	10	806	12,756	7,181	1,005,617	140	100,562
	3	25	1,584	28,233	17,694	1,849,549	105	73,982
	All	35	2,390	40,989	24,875	2,855,166	115	81,576
2002	1&2	9	850	14,782	8,813	1,055,835	120	117,315
	3	30	1,742	32,349	20,791	2,057,241	99	68,575
	All	39	2,592	47,131	29,604	3,113,076	105	79,822
2003	1&2	7	822	16,465	10,561	1,019,904	97	145,701
	3	27	1,721	36,664	22,962	2,224,344	97	82,383
	All	34	2,543	53,129	33,523	3,244,248	97	95,419
2004	1&2	8	631	15,100	9,105	773,472	85	96,684
	3	27	1,678	41,259	26,220	2,364,384	90	87,570
	All	35	2,309	56,359	35,325	3,137,856	89	89,653
2005	1&2	7	514	11,779	7,674	585,088	76	83,584
	3	29	1,389	38,549	25,435	2,159,304	85	74,459
	All	36	1,903	50,328	33,109	2,744,392	83	76,233
2006	1&2	8	518	13,806	9,827	617,824	63	77,228
	3	21	1,326	41,756	29,659	2,439,100	82	116,148
	All	29	1,844	55,562	39,486	3,056,924	77	105,411
2007	1&2	10	695	19,064	13,726	814,080	59	81,408
	3	23	1,459	48,125	35,971	2,411,808	67	104,861
	All	33	2,154	67,189	49,697	3,225,888	65	97,754
2008	1&2	11	690	19,674	14,784	733,786	50	66,708
	3	21	1,386	48,116	36,564	2,180,640	60	103,840
	All	32	2,076	67,790	51,348	2,914,426	57	91,076
2009	1&2	11	714	21,803	15,485	722,817	47	65,711
	3	25	1,228	45,774	34,420	1,871,329	54	74,853
	All	36	1,942	67,577	49,905	2,594,146	52	72,060
2010	1&2	10	544	17,732	12,169	478,480	39	47,848
	3	24	1,354	50,141	37,120	1,873,438	50	78,060
	All	34	1,898	67,873	49,289	2,351,918	48	69,174

* LPUE values are computed from only those trips which have both Hours Fished and Landings data reported. The Hours Fished and Landings values displayed in this table are gross reported totals, and hence may not be divided to calculate LPUE. Hours Fished values are thought to be under-reported in the Northern New Jersey region between 1986 and 1990, due to strict limits on surfclam fishing time in the management regime prior to Amendment #8.
Source: NMFS Clam Vessel Logbook Files.

Appendix Table 2. Ocean Quahog Fishery in the EEZ: Number of Vessels, Trips, Hours at Sea, Hours Fishing, Landings (bushels), Landings per Unit Effort (bu/hour fishing), and Average Landings per Vessel

Year	Class	Vessels	Trips	Hours at Sea	Hours Fishing	Quahog Landings	LPUE*	Ave Bu. per Boat
1979	1 & 2	22	735	10,325	4,333	477,346	109	21,698
	3	37	1,966	35,635	19,545	2,557,350	127	69,118
	All	59	2,701	45,960	23,878	3,034,696	124	51,436
1980	1 & 2	19	561	7,836	3,528	354,110	95	18,637
	3	33	1,950	39,488	22,025	2,607,679	114	79,021
	All	52	2,511	47,324	25,553	2,961,789	111	56,957
1981	1 & 2	12	399	5,965	2,793	248,498	88	20,708
	3	35	2,011	37,914	20,859	2,639,789	125	75,423
	All	47	2,410	43,879	23,652	2,888,287	121	61,453
1982	1 & 2	12	274	4,414	2,391	187,447	77	15,621
	3	31	2,146	39,956	21,515	3,053,328	136	98,494
	All	43	2,420	44,370	23,906	3,240,775	130	75,367
1983	1 & 2	8	225	3,561	1,936	159,214	81	19,902
	3	29	2,243	40,718	21,072	3,056,426	142	105,394
	All	37	2,468	44,279	23,008	3,215,640	137	86,909
1984	1 & 2	16	467	7,266	3,873	369,529	92	23,096
	3	41	2,738	51,563	26,845	3,593,438	129	87,645
	All	57	3,205	58,829	30,718	3,962,967	124	69,526
1985	1 & 2	17	611	9,352	4,756	483,004	99	28,412
	3	47	3,101	58,462	28,988	4,086,505	138	86,947
	All	64	3,712	67,814	33,744	4,569,509	133	71,399
1986	1 & 2	16	471	8,795	4,159	441,192	103	27,575
	3	56	2,714	51,648	25,292	3,726,013	146	66,536
	All	72	3,185	60,443	29,451	4,167,205	140	57,878
1987	1 & 2	16	333	7,359	3,405	359,042	105	22,440
	3	55	2,995	59,220	29,482	4,383,983	146	79,709
	All	71	3,328	66,579	32,887	4,743,025	142	66,803
1988	1 & 2	11	221	4,555	2,088	251,674	114	22,879
	3	51	2,818	60,554	31,213	4,217,699	133	82,700
	All	62	3,039	65,109	33,301	4,469,373	132	72,087
1989	1 & 2	13	540	9,823	4,945	650,059	124	50,005
	3	56	3,055	66,364	34,671	4,280,221	121	76,433
	All	69	3,595	76,187	39,616	4,930,280	122	71,453
1990	1 & 2	14	496	11,002	6,470	623,346	96	44,525
	3	42	2,753	62,569	34,614	3,999,071	115	95,216
	All	56	3,249	73,571	41,084	4,622,417	112	82,543
1991 - Excludes Maine Fishery								
	1&2	11	545	11,889	6,343	731,634	115	66,512
	3	38	2,824	68,002	39,531	4,108,190	103	108,110
	All	49	3,369	79,911	45,874	4,839,824	104	98,772

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Appendix Table 2. Continued

Year	Class	Vessels	Trips	Hours at Sea	Hours Fishing	Quahog Landings	LPUE*	Ave. Bu. per Boat
1992 - Excludes Maine Fishery								
	1&2	9	527	11,267	5,464	693,971	127	77,108
	3	34	2,563	61,914	31,678	4,244,729	132	124,845
	All	43	3,090	73,181	37,142	4,938,700	131	114,853
1993 - Excludes Maine Fishery								
	1&2	8	535	12,764	6,442	720,702	112	90,088
	3	28	2,655	67,549	38,860	4,091,239	105	146,116
	All	36	3,190	80,313	45,302	4,811,941	106	133,665
1994 - Excludes Maine Fishery								
	1&2	7	444	10,748	5,580	580,198	104	82,885
	3	29	2,683	65,734	38,764	4,031,197	104	139,007
	All	36	3,127	76,482	44,344	4,611,395	104	128,094
1995 - Excludes Maine Fishery								
	1&2	6	480	12,168	7,116	692,491	97	115,415
	3	30	2,496	60,216	32,752	3,935,832	120	131,194
	All	36	2,976	72,384	39,868	4,628,323	116	128,565
1996 - Excludes Maine Fishery								
	1&2	5	429	11,439	6,026	678,804	113	135,761
	3	31	2,116	52,328	27,104	3,712,624	137	119,762
	All	36	2,545	63,767	33,130	4,391,428	133	121,984
1997 - Excludes Maine Fishery								
	1&2	6	413	12,570	6,860	684,684	100	114,114
	3	25	1,881	52,535	27,154	3,594,375	132	143,775
	All	31	2,294	65,105	34,014	4,279,059	126	138,034
1998 - Excludes Maine Fishery								
	1&2	5	375	11,491	6,371	587,228	92	117,446
	3	19	1,582	49,236	25,331	3,310,259	131	174,224
	All	24	1,957	60,727	31,702	3,897,487	123	162,395
1999 - Excludes Maine Fishery								
	1&2	5	382	10,817	5,952	559,200	94	111,840
	3	18	1,696	50,612	25,748	3,211,088	125	178,394
	All	23	2,078	61,429	31,700	3,770,288	119	163,926
2000 - Excludes Maine Fishery								
	1&2	6	270	7,933	4,330	429,686	99	71,614
	3	23	1,541	48,369	24,110	2,730,963	113	118,738
	All	29	1,811	56,302	28,440	3,160,649	111	108,988
2001 - Excludes Maine Fishery								
	1&2	6	454	13,588	7,183	778,469	108	129,745
	3	24	1,654	51,637	26,702	2,912,538	109	121,356
	All	30	2,108	65,225	33,885	3,691,007	109	123,034
2002 - Excludes Maine Fishery								
	1&2	6	428	12,589	6,644	712,243	107	118,707
	3	25	1,559	49,424	23,979	3,158,407	132	126,336
	All	31	1,987	62,013	30,623	3,870,650	126	124,860

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Appendix Table 2. Continued

Year	Class	Vessels	Trips	Hours at Sea	Hours Fishing	Quahog Landings	LPUE*	Ave. Bu. per Boat
2003 - Excludes Maine Fishery								
	1&2	6	472	15,132	8,633	801,440	93	133,573
	3	21	1,469	50,793	25,717	3,267,308	127	155,586
	All	27	1,941	65,925	34,350	4,068,748	118	150,694
2004 - Excludes Maine Fishery								
	1&2	6	380	12,100	7,070	633,888	90	105,648
	3	23	1,386	48,888	24,659	3,189,600	129	138,678
	All	29	1,766	60,988	31,729	3,823,488	121	131,844
2005 - Excludes Maine Fishery								
	1&2	5	149	4,521	2,076	170,752	82	34,150
	3	19	1,061	36,508	19,959	2,768,864	139	145,730
	All	24	1,210	41,029	22,035	2,939,616	133	122,484
2006 - Excludes Maine Fishery								
	1&2	4	206	5,316	2,338	283,072	121	70,768
	3	14	974	34,339	18,798	2,783,264	148	198,805
	All	18	1,180	39,655	21,136	3,066,336	145	170,352
2007 - Excludes Maine Fishery								
	1&2	4	215	6,124	3,266	312,672	96	78,168
	3	13	1,057	38,656	20,786	3,053,120	147	234,855
	All	17	1,272	44,780	24,052	3,365,792	140	197,988
2008 - Excludes Maine Fishery								
	1&2	3	85	2,659	1,493	148,576	100	49,525
	3	15	1,108	40,752	23,485	3,225,088	137	215,006
	All	18	1,193	43,411	24,978	3,373,664	135	187,426
2009 - Excludes Maine Fishery								
	All	15	1,124	41,445	24,426	3,433,869	141	228,925
2010 - Excludes Maine Fishery								
	1&2	3	131	4,482	2,624	228,064	87	76,021
	3	18	1,053	40,023	23,990	3,322,266	138	184,570
	All	21	1,184	44,505	26,614	3,550,330	133	169,063

Maine Ocean Quahog Fishery

Year	Class	Vessels	Trips	Hours at Sea	Hours Fishing	Quahog Landings	LPUE*	Ave. Bu. per Boat
1991	All	45	2,221	23,465	17,162	36,679	2.0	815
1992	All	53	1,677	17,711	13,469	24,839	1.8	469
1993	All	33	685	9,732	5,748	17,144	3.0	520
1994	All	30	792	7,189	5,102	21,480	4.2	716
1995	All	30	1,052	8,233	5,747	37,912	6.6	1,264
1996	All	25	1,374	11,811	8,483	47,025	5.5	1,881

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Appendix Table 2. Continued

Year	Class	Vessels	Trips	Hours at Sea	Hours Fishing	Quahog Landings	LPUE*	Ave. Bu. per Boat
1997	All	34	1,945	16,285	11,829	72,706	6.1	2,138
1998	All	39	1,820	18,452	11,777	72,466	6.2	1,858
1999	All	38	1,998	16,188	11,455	93,938	8.2	2,472
2000	All	34	2,197	18,015	12,739	120,767	9.5	3,552
2001	All	31	2,040	18,250	13,350	108,500	8.1	3,500
2002	All	35	2,604	23,724	16,967	128,574	7.6	3,674
2003	All	35	2,674	24,383	17,853	119,675	6.7	3,419
2004	All	34	2,568	25,777	19,022	102,187	5.4	3,006
2005	All	32	2,306	22,794	17,063	100,115	5.9	3,129
2006	All	25	2,177	20,202	14,902	121,373	8.1	4,855
2007	All	24	1,930	18,768	14,018	102,006	7.3	4,250
2008	All	22	1,371	14,251	10,795	66,946	6.2	3,043
2009	All	19	1,237	12,838	9,705	55,649	5.7	2,929
2010	All	15	1,219	12,970	9,709	56,406	5.8	3,760

NOTE 1: This table includes ocean quahog landings records from the Clam logbooks ONLY, and does NOT include landings submitted in the Multispecies logbooks until 1998.

NOTE 2:. The bushel unit used in the Maine fishery measures 1.2445 cubic feet. The standard bushel unit used in the industrial ITQ fishery outside Maine is 1.88 cubic feet.

* LPUE values are computed from only those trips which have both Hours Fished and Landings data reported. The Hours Fished and Landings values displayed in this table are gross reported totals, and hence may not be divided to calculate LPUE.

Source: NMFS Clam Vessel Logbook Files

Appendix Table 3. 2010 vs. 2009 Surfclam Landings by Degree Square

Partially-Audited Data - Includes all trips reported as of 5/7/2011

Note: Degree squares 4168 & 4169 were combined for reasons of confidentiality.

Degree Square	2009 Surfclam Bushels	2010 Surfclam Bushels	% Change	2009 LPUE	2010 LPUE	% Change	2010 % of Catch	2010 Landings Ranking
3774	10,880	1,024	-91%	81	39	-51%	0.0%	
3873	6,368	2,784	-56%	40	39	-4%	0.1%	
3874	259,744	211,264	-19%	44	49	11%	9.0%	
3972	3,040			46				
3973	**1,425,825**	**912,368**	**-36%**	**54**	**44**	**-18%**	**38.8%**	**#1**
3974	**202,784**	**304,356**	**50%**	**45**	**36**	**-20%**	**12.9%**	**#4**
4069		96			5		0.0%	
4070								
4071								
4072	40,800	17,568	-57%	53	46	-14%	0.7%	
4073	**466,372**	**356,076**	**-24%**	**48**	**41**	**-15%**	**15.1%**	**#3**
4168 & 4169	**175,581**	**540,686**	**208%**	**83**	**83**	**-1%**	**23.0%**	**#2**
4170	2,752	5,696	107%	81	58	-28%	0.2%	
Total	**2,594,146**	**2,351,918**	**-9%**	**52**	**48**	**-8%**	**100.0%**	

Appendix Table 4. 2010 vs. 2009 Ocean Quahog Landings by Degree Square

Partially-Audited Data - Includes all trips reported as of 5/7/2011

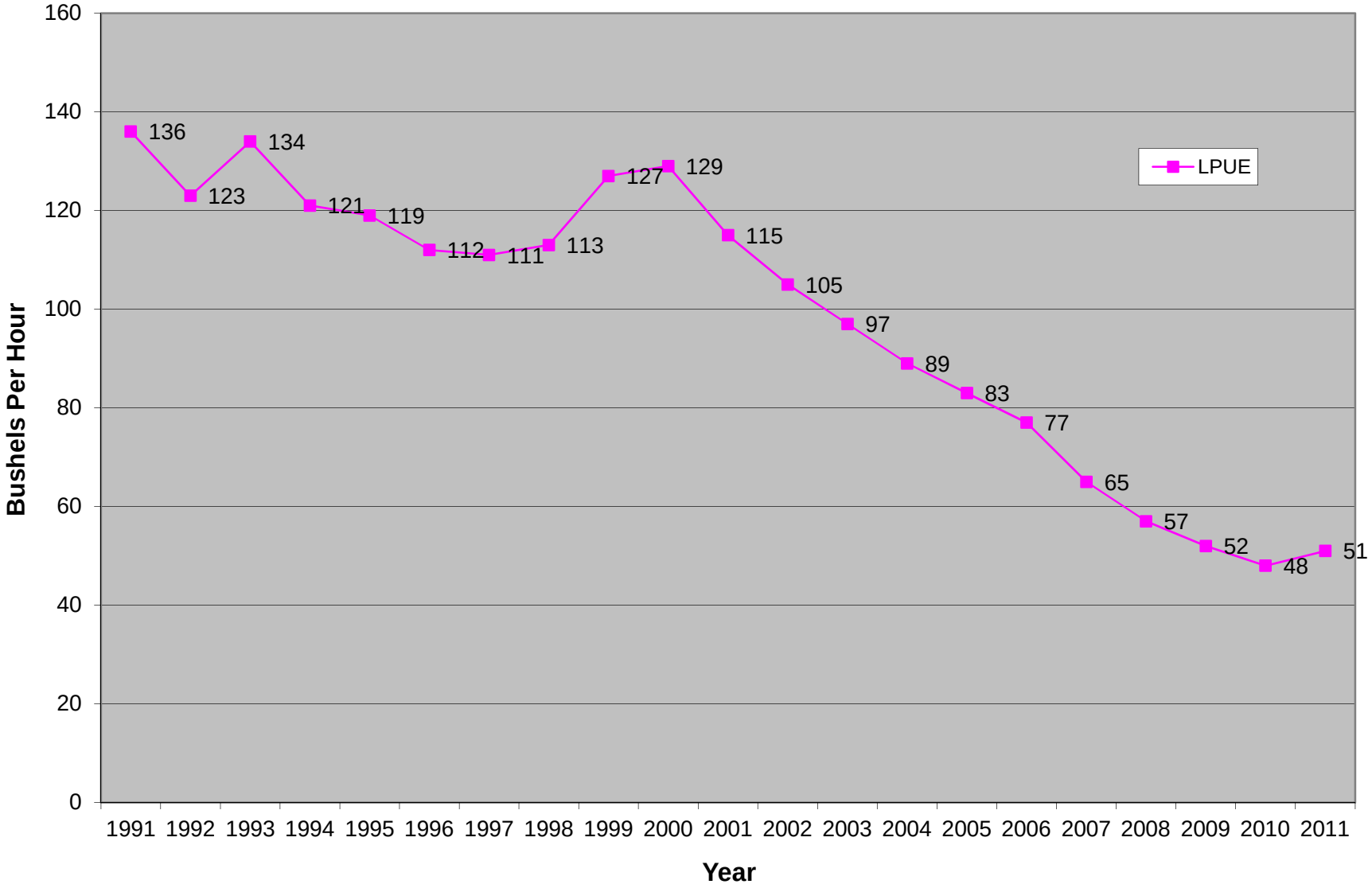
Excludes Maine Fishery

Note: Degree squares 4168 & 4169 were combined for reasons of confidentiality.

Degree Square	2009 Quahog Bushels	2010 Quahog Bushels	% Change	2009 LPUE	2010 LPUE	% Change	2010 % of Catch	2010 Landings Ranking
3774	17,888	74,464	316%	57	54	-5%	2.1%	
3873	116,160	100,672	-13%	76	71	-6%	2.8%	
3874	24,800	48,032	94%	56	56	0%	1.4%	
3972	270,400	90,496	-67%	155	112	-27%	2.5%	
3973	**342,506**	**319,222**	**-7%**	**106**	**87**	**-18%**	**9.0%**	**#3**
3974	5,952			73				
4069		9,120			186		0.3%	
4070	36,096	103,200	186%	169	192	14%	2.9%	
4071	**789,190**	**577,110**	**-27%**	**148**	**132**	**-11%**	**16.3%**	**#2**
4072	**1,534,366**	**1,889,934**	**23%**	**172**	**172**	**0%**	**53.2%**	**#1**
4073	**19,456**	**175,072**	**800%**	**89**	**106**	**20%**	**4.9%**	**#4**
4168 & 4169	3,808	2,816	-26%	127	141	11%	0.1%	
4170	148,990	160,192	8%	151	182	20%	4.5%	
4171	124,257			92				
4172								
Total	**3,433,869**	**3,550,330**	**3%**	**141**	**133**	**-5%**	**100.0%**	

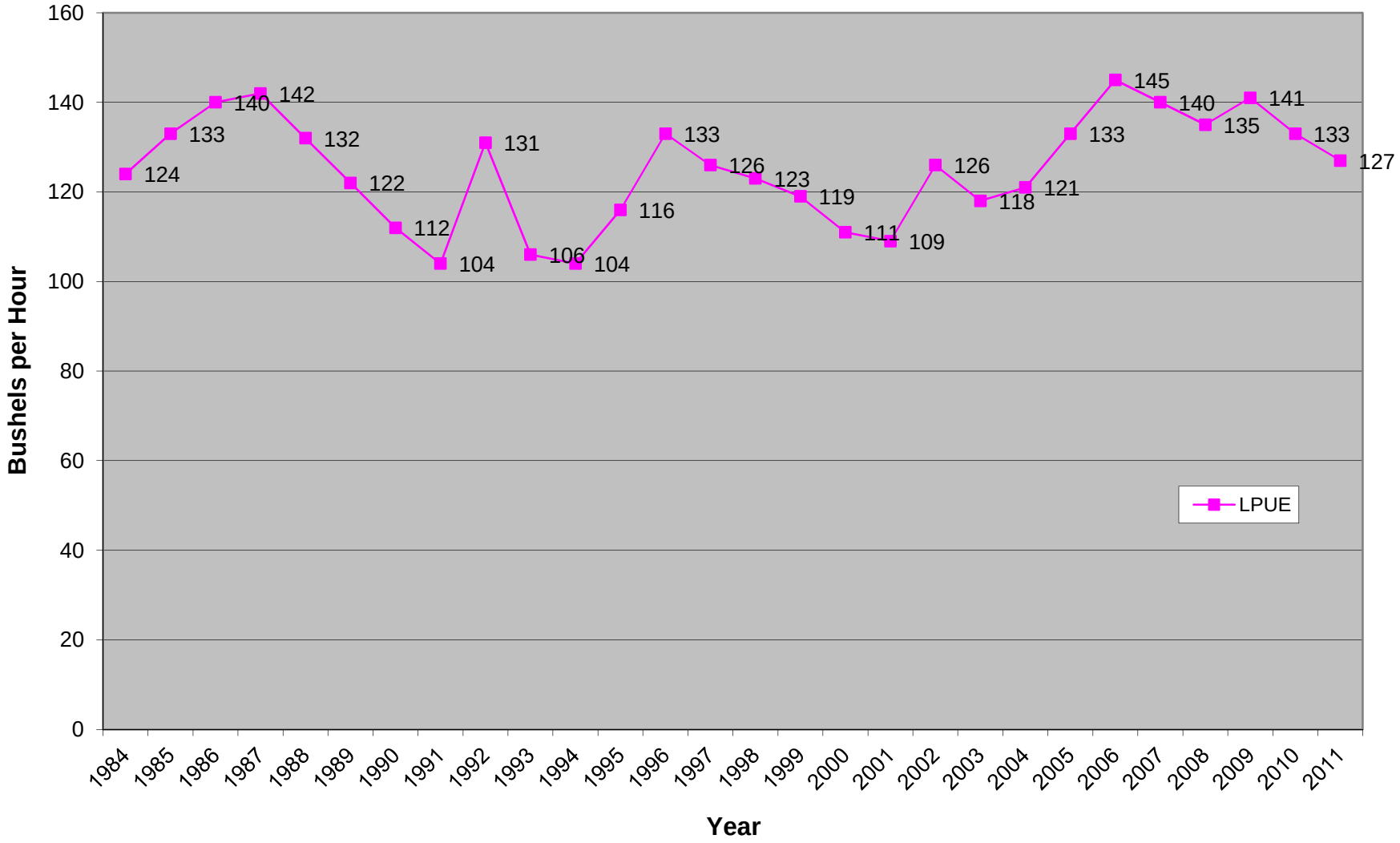
Appendix Figure 1: Surfclam Landings Per Unit of Effort: 1991 - 2011*

All Vessel Classes - *2011 Trips Reported Through 5/07/11 Only

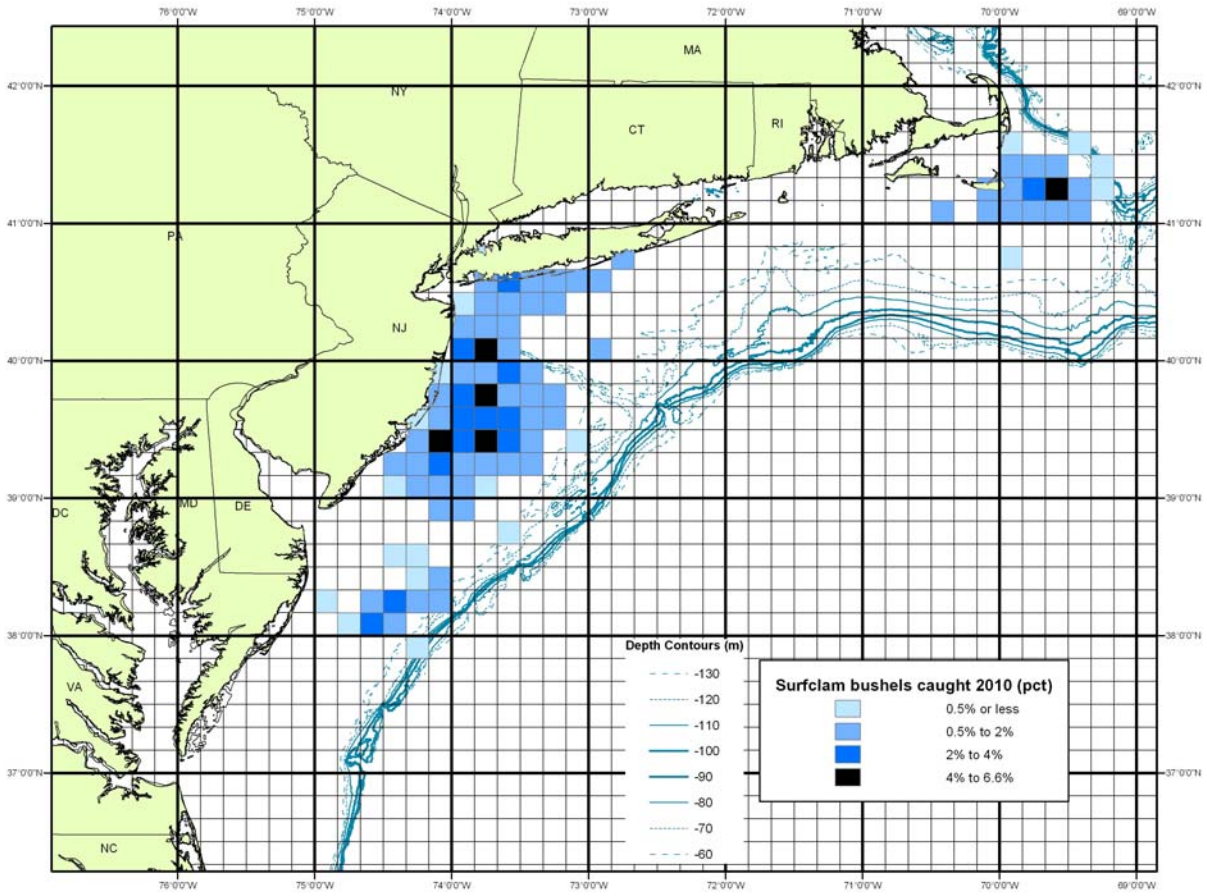


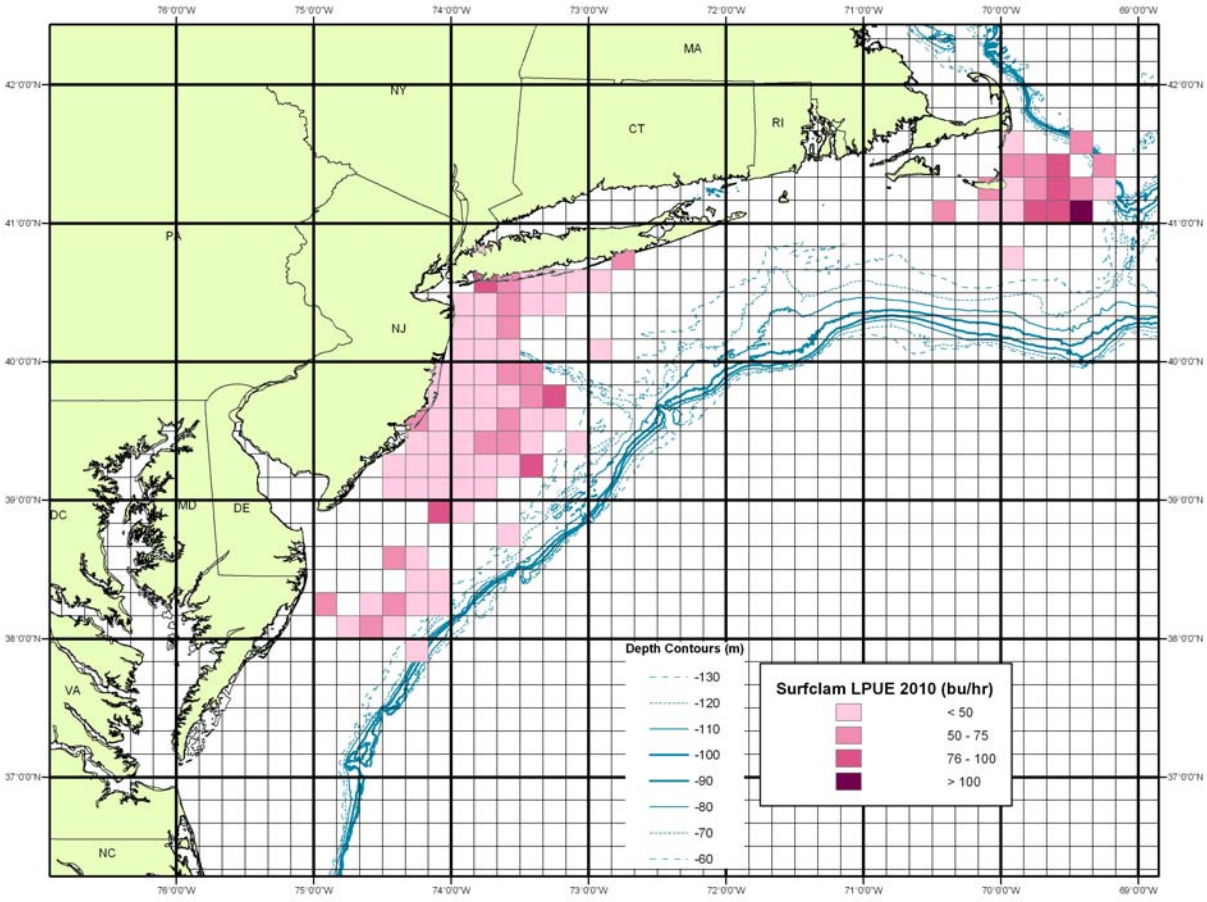
App. Figure 2: Ocean Quahog Landings per Unit of Effort: 1984 - 2011*

All Vessel Classes - Excludes Maine Fishery - *2011 Trips reported through 5/07/11 only

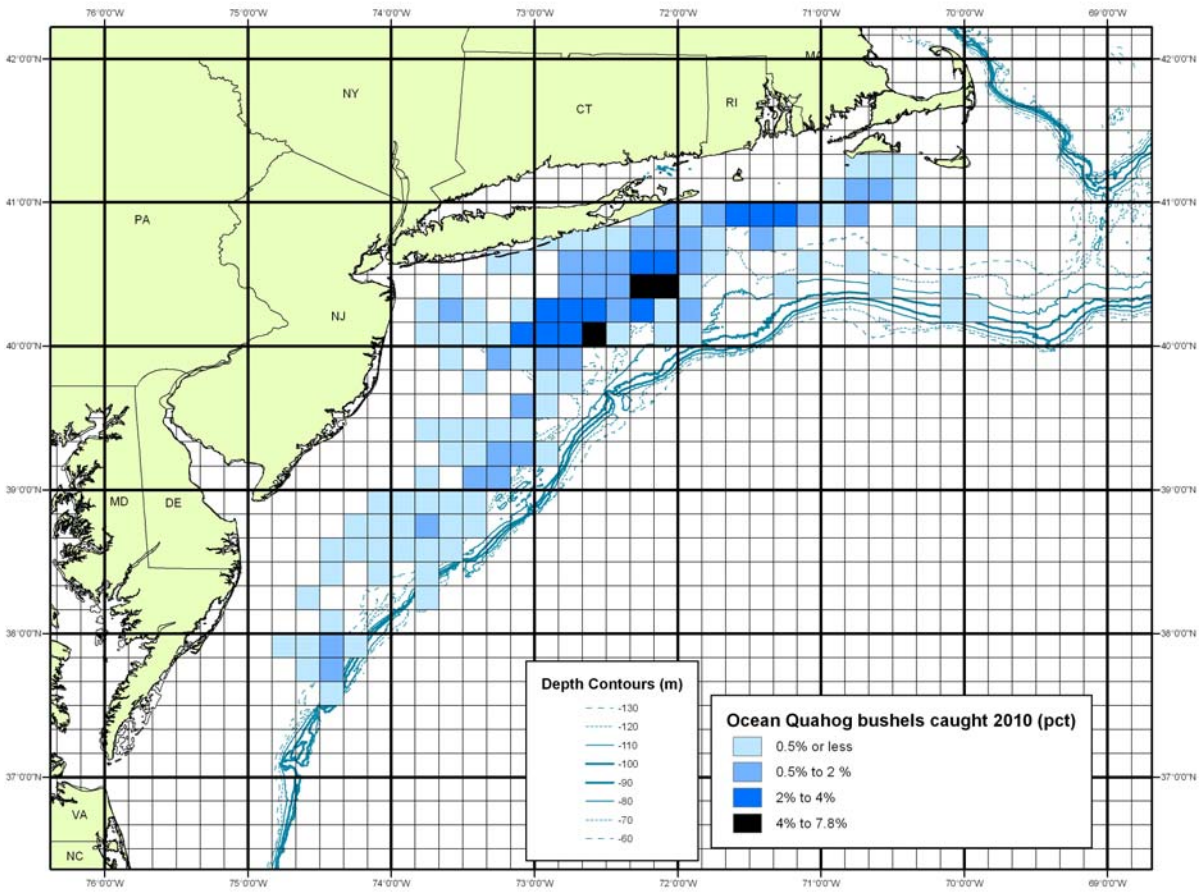


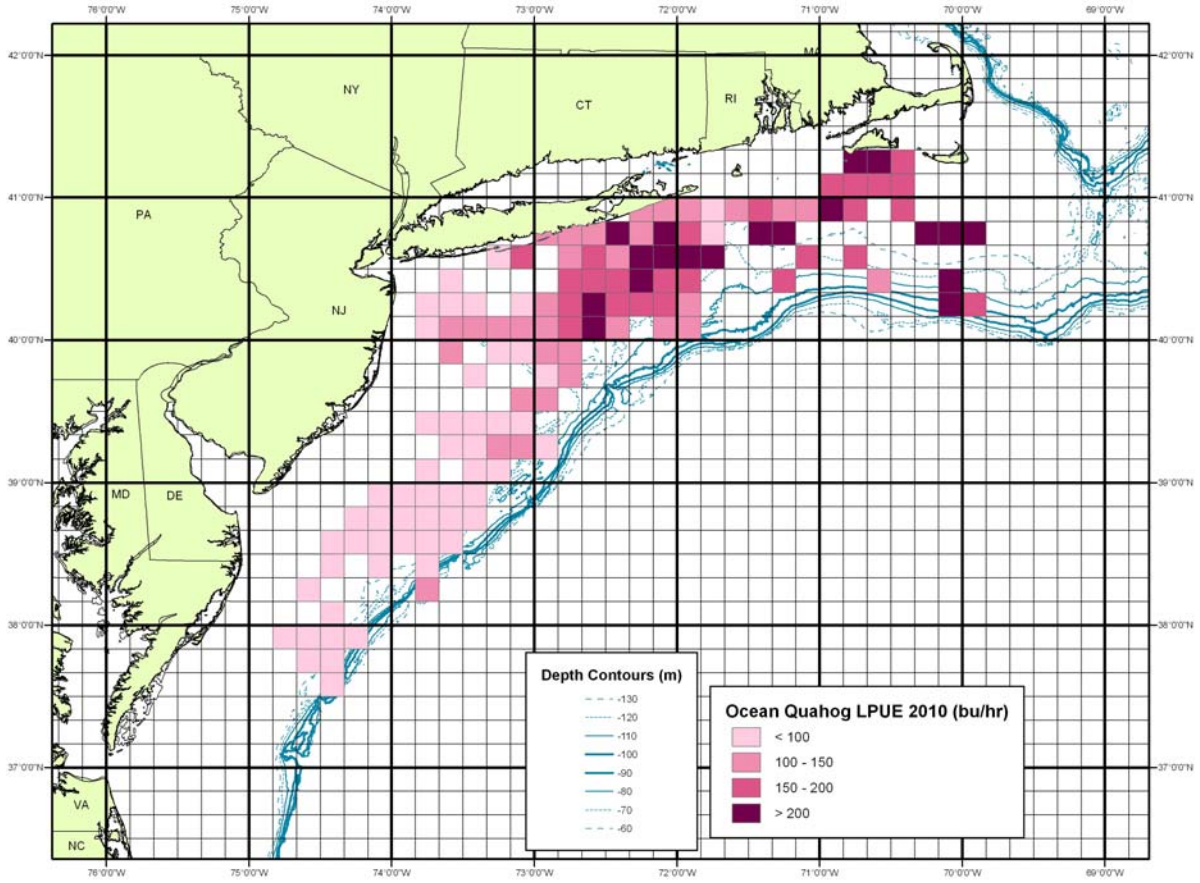
App. Figure 3. 2010 Surfclam Harvests (upper) and LPUE (lower) by 10 Minute Square Excludes Experimental Fishery on Georges Bank





App. Figure 4. 2010 Ocean Quahog Harvests (upper) & LPUE (lower) by 10 Minute Square Excludes Maine Fishery and Experimental Fishery on Georges Bank





A. ATLANTIC SURFCLAM ASSESSMENT SUMMARY FOR 2009

State of Stock

The Atlantic surfclam stock in the US EEZ (Exclusive Economic Zone, 3 to 200 nm from shore, Figure A1), is not overfished and overfishing is not occurring. Surfclam biomass varies with latitude. Relative to historic conditions, in the southern regions (DMV and NJ) recruitment, growth rate, and biomass have declined. In contrast, surfclam biomass and recruitment have increased on Georges Bank and the Long Island region. Estimated stock biomass during 2008 (120+ mm shell length, SL) was 878 thousand mt meats, which is above the biomass target (B_{Target} = ½ 1999 biomass = 543 thousand mt meats) and above the biomass threshold ($B_{Threshold}$ = ½ B_{Target} = 272 thousand mt meats) (Figure A2). Estimated fishing mortality during 2008 was F= 0.027 y^{-1}, which is below the overfishing threshold ($F_{Threshold} = M = 0.15\ y^{-1}$) (Figure A3). These estimates are for the EEZ stock only, exclude state waters, and include the portion of the EEZ stock on Georges Bank where no fishing occurred between 1990 and 2008.

Landings and Status Table: Atlantic surfclam (EEZ only, 1000 mt) [4]

Year:	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Min[1]	Max[1]	Mean[1]
Quota	19.8	19.8	22	24.2	25.1	26.2	26.2	26.2	26.2	26.2	13.8	26.2	21.4
Landings:[2,3,4]	19.6	19.7	22	24	25	24.2	21.2	23.6	24.9	22.5	6.4	33.8	20.1
Biomass:[4,5]	1086	1074	1059	1037	1012	984	955	931	905	878	831	1092	995
Fishing mortality:[3,4]	0.019	0.019	0.022	0.025	0.026	0.026	0.023	0.027	0.029	0.027	0.018	0.031	0.024
Recruitment:	98	95	94	89	87	84	82	82	81	80	80	112	99

[1] Min, max and mean for 1965-2008 (landings), 1978-2008 (quota), 1981-2008 (biomass and fishing mortality), or 1982-2008 (recruitment).
[2] Landings not adjusted for incidental mortality, which is assumed to be ≤12% of landings. Discards have been very low since 1992.
[3] Fishing mortality is an annual rate assuming that incidental mortality was 12% of landings.
[4] See assessment for regional estimates.
[5] For shell lengths 120mm+.

Projections

Projections were used for two purposes: 1) to forecast future stock conditions and 2) for decision table analyses in which the relative performance of a range of realistic management policies (harvest levels) was evaluated. Projections of both types were for 2009-2015. For projections, landings in 2009 were estimated in October of 2009 based on available data. Catches in simulation analyses included a 12% allowance for incidental mortality.

Projections of both types examined four plausible harvest strategies during 2010-2015 (see table below). The "FMP minimum" management strategy assumed that landings during 2010-2015 would be at the minimum quota level specified in the Fishery Management Plan (FMP). The "Industry estimated" strategy assumed landings anticipated by industry representatives who participated on the Working Group. The "FMP maximum" strategy assumed landings at the maximum quota level specified in the FMP. The "F_{MSY} proxy" policy assumed catches at the fishing mortality rate threshold (F=M=0.15 y^{-1}). Additional details are given in the SARC49 assessment report.

Management strategies used in projection analyses, expressed in terms of total catch.

Year	FMP minimum	Industry estimate	FMP maximum	F_{MSY} proxy
Assumed catch in 1000 mt (landings + 12% incidental mortality allowance)				
2008	25.2	25.2	25.2	25.2
2009	20.7	20.7	20.7	20.7
2010	16.0	21.6	29.4	129.3
2011	16.0	23.3	29.4	114.0
2012	16.0	25.0	29.4	102.3
2013	16.0	25.9	29.4	93.4
2014	16.0	25.9	29.4	86.8
2015	16.0	25.9	29.4	73.5

Forecast projections

Forecast results (Figure A4) indicate that surfclam biomass will continue to decline slowly through 2015. In all cases, this occurs because surplus production has been negative and is likely to remain negative due to poor recruitment and slow growth in the more southern regions.

Decision table analysis

Projections for decision table analysis (Table A1) included three values for natural mortality (low, medium and high levels of natural mortality with M=0.1, 0.15 and 0.2 per year) and three survey dredge catchabilities as "states of nature". The states of nature were considered in combination and assigned subjective probabilities. The probability of overfishing and overfished status for this stock appears low under all of the states of nature considered. Overfishing and overfished status are more likely if target fishing mortality rates rise to the threshold level F_{MSY} proxy = 0.15. Additional details are given in the SARC49 assessment report.

Stock Distribution and Identification

The US Atlantic surfclam stock is distributed from Maine to North Carolina at depths ranging from the sub-tidal zone in state waters to about 50 m in the EEZ. Atlantic surfclams in the EEZ are assessed and managed as a single unit stock, although there are differences between regions in biological characteristics, fishing activity and population dynamics. From north to south, regions of interest are: Georges Bank (GBK), Southern New England (SNE), Long Island (LI), New Jersey (NJ), Delmarva (DMV) and southern Virginia (SVA) (Figure A1).

Catches

Catch is assumed to be 12% larger than landings in stock assessment calculations to adjust for incidental mortality during fishing. The 12% incidental mortality estimate is considered to be an upper bound. Incidental mortality may occur when surfclams contact fishing equipment (i.e. dredge and sorting equipment) but are not landed.

Discarding reached substantial levels (33% by weight of the total catch in the NJ region) in the late 1970s because of minimum size limits, declined through the mid- to late-1980s, and has been near zero since 1992 following the suspension of minimum size limits in 1990.

Annual landings from the EEZ were variable prior to 1979 (Figure A5). In particular, landings decreased from 15 thousand mt meats during 1965 to a record low of 6 thousand mt during 1970. Landings increased to a record high of 34 thousand mt during 1974. Landings stabilized by 1983 due to quota management and varied between 19 and 25 thousand mt per year in later years. Landings in 2008 were 22 thousand mt. The EEZ quota and landings are generally similar, although landings have been less than the quota during 2004-2008 due to market demand.

Since 1979, 85-100% of landings have been taken from the Mid-Atlantic Bight (SVA, DMV and NJ). Areas of highest landings have shifted north from DMV to NJ over time (Figure A6). After 1983, the importance of DMV declined and NJ has supplied the bulk of landings since 1985. About 8% of landings were taken from SNE and LI since 2005.

The regional distribution of fishing effort (Figure A7) is similar to that of landings (Figure A6) although fishing effort in DMV has increased in recent years. Declining LPUE trends (Figures A8) reflect stock conditions for regions where clam fishing occurred (excluding Georges Bank) but overstate declines in biomass for the stock as a whole (including GBK, Figure A10).

Data and Assessment

The updated assessment is similar to the previous SAW-44 assessment. Improvements include updated estimates of survey gear efficiency, survey gear size selectivity, growth curves and shell length-meat weight relationships based on fresh (unfrozen) samples. Age composition data from the 1982 to 2008 NEFSC clam surveys were utilized more fully than in previous assessments. An updated KLAMZ model was used to assess fishable biomass and fishing mortality during 1981-2008 for the entire stock and for the DMV and NJ regions. Also, efficiency corrected swept area biomass was calculated for all regions based on survey data for 1997-2008. New discard estimates for 1976-1981 were incorporated.

Biological Reference Points

The current proxy for F_{MSY} is $F = M = 0.15$ y^{-1} (Figure A3). The proxy for B_{MSY} is one-half of the estimated fishable biomass during 1999 (Figure A2). The 1999 biomass and related biological reference points were re-estimated in this assessment. The original and revised reference point values are shown in the table below.

By definition, overfishing occurs whenever the fishing mortality rate on the entire stock is larger than F_{MSY} proxy. The stock would be considered overfished if total biomass fell below $B_{Threshold}$ (estimated as ½ B_{MSY} proxy). When stock biomass is less than the biomass threshold, the fishing mortality rate threshold is reduced from F_{MSY} to zero in a linear manner.

Reference Point	Last assessment	Revised
F_{MSY}	M=0.15 y^{-1}	Same
B_{1999}	1,460 thousand mt meats	1086 thousand mt meats
B_{MSY} =½B_{1999} (target)	730 thousand mt meats	543 thousand mt meats
$B_{Threshold}$ = ½ B_{MSY}	365 thousand mt meats	272 thousand mt meats

Revised biomass reference points are lower than previous values primarily because of new information about the shell length and meat weight relationships, and about the efficiency and size selectivity of the dredge used in NEFSC clam surveys.

Fishing Mortality

Based on the KLAMZ model for the entire stock, fishing mortality for surfclams during 2008 was $F = 0.027$ (CV = 0.16, Figure A9). Fishing mortality rates are near zero in the north and at the highest levels estimated in the assessment for 1982-2008 in the south ($F = 0.07$ [CV = 0.16] in DMV, and approximately $F = 0.1$ [CV = 0.16] in NJ during 2008). Fishing mortality for the whole stock began increasing in 1997 to current levels that are close to the peak levels estimated for the mid-1980s. Landings have been relatively constant during recent years (Figure A6) and the increase in fishing mortality since 1997 can be explained by the decline in biomass (Figure A10) and increase in fishing effort (Figure A7).

Recruitment

Recruitment has been below average since 1999 (Figure A11). The last strong year classes on GBK, NJ and DMV occurred in 1999, 1992 and 1993, respectively. The assessment report describes factors that may have reduced recent surfclam recruitments in the DMV and NJ regions.

Stock Biomass

Biomass of the total Atlantic surfclam stock (120+ mm shell length [SL]) is declining from high levels during the late 1990s to current levels which are similar to the levels during 1981-1992 (Figure A10). High stock biomass (120+ mm SL) during the late 1990s was due to good recruitment (Figure A11) and relatively faster growth rates in southern regions in the past. Total biomass increased to peak levels during the late 1990's (Figure A10) and then declined at about 3% per year afterwards. Stock biomass during 2008 was 878 (CV = 0.16) thousand mt.

The decline in surfclam biomass since the late 1990s (Figure A10) can be explained by negative surplus production caused by lower recruitment and slower growth rates in the NJ and DMV regions (Figures A11, A12 and A13).

The distribution of surfclam biomass has shifted to the north during 1982-2008 (Figures A14 and A15). NJ held the largest fraction of surfclam biomass during 1994-2002. During 2008, the largest fraction of surfclam biomass was in GBK (Figure A15) due to declining biomass in DMV and NJ, and increasing biomass on GBK.

Special Comments

Although the total surfclam stock is above the biomass threshold, biomass varies from north to south with the southern DMV resource in relatively poor condition, the NJ region (where the fishery is concentrated) in fair condition, and the SNE, LI and GBK regions in nearly virginal condition. DMV and NJ are experiencing poor recruitment and reduced growth rates.

An alternative stock structure should be considered in the next surfclam assessment because of biological and fishery differences among regions.

Commercial LPUE data were not used in the assessment model because LPUE does not necessarily represent total stock biomass. Nevertheless, declining trends in LPUE for DMV, NJ, and LI correspond with declining surfclam trends in the NEFSC survey data for these regions (Figure A8).

The Georges Bank (GBK) region currently contains approximately 48% of the stock biomass. GBK has been closed to fishing for many years due to the threat of Paralytic Shellfish Poisoning (PSP). The FDA recently reopened GBK to fishing for surfclams contingent on continued testing for and absence of PSP.

Agency, academic and industry personnel have made progress in estimating the efficiency of NEFSC and commercial clam survey dredges. Collaborative studies to measure dredge efficiency should continue.

The "dome-shaped" size-selectivity of the NEFSC survey dredge was characterized based on cooperative field work in 2008. As this information had a substantial effect on the current stock assessment, it would be advisable to repeat the field experiment.

Given past issues with the *Delaware II* NEFSC clam survey dredge gear, including low and variable capture efficiency as well as "dome-shaped" size selectivity, these aspects of the surfclam survey could be improved by using a commercial clam dredge, preferably with a liner and other modifications to increases catches of small surfclams.

A constant M (0.15 y^{-1}) was assumed in the assessment, but that value is uncertain and should be re-evaluated in the next assessment. Reductions in biomass in inshore southern regions are due partly to changes in environmental conditions and likely increasing natural mortality in those areas.

The current biomass reference points were based on the observation that the stock was at a high biomass level in 1999. Biomass reference points might be reviewed, given potential climate related shifts in distribution and the *ad-hoc* basis of the reference points.

The current proxy for F_{MSY} is $M = 0.15$. This reference point should be reviewed in the next assessment. The productivity of the stock appears low for a species with $M = 0.15$, and geographic variation in natural mortality rate is likely.

Growth curves fit to survey age data, and used in stock assessment modeling, indicate that growth rates have declined in the southern regions (DMV and NJ). These changes should have a substantial effect on potential fishery yield in some regions. The proportion of the stock in the south has declined. The northern region now contains most of the stock biomass, and the growth rate there is unchanged. For the entire stock, growth rate of has been relatively stable.

The bulk of fishing effort takes place in the southern DMV and NJ regions where regional fishing mortality rates were 7% and 10% per year during 2008. The long term performance of the fishery at these mortality rates is uncertain because these levels of regional fishing mortality are relatively high from a historical perspective.

Model results indicate that surplus production for the stock as a whole and particularly in the southern regions (NJ, DMV) has been negative indicating that biomass would have declined even in the absence of fishing.

Under current FMP specifications, the surfclam resource is not "vulnerable" to becoming overfished or likely to experience overfishing by 2015. Total stock biomass is relatively high, total fishing mortality rates are low (3% per year according to KLAMZ models), and the FMP restricts harvest to levels far below the F_{MSY} proxy harvest level. The relatively low biomass, slow growth and poor recruitment of stock in the south (DMV and NJ) are offset by better conditions in the north.

Although the current KLAMZ stock assessment model is performing well, it assumes a smooth trend in recruitment from year to year that is not supported by survey age composition data.

A preliminary stock synthesis assessment model (SS3) for the entire surfclam stock was developed for review and potential use as the main model in the next assessment. It is not intended for use by managers in this assessment cycle because of a variety of issues that were not fully resolved.

In the early 1970s surfclams were landed off Chesapeake Bay, but were fished down rapidly. The fishery then returned to traditional grounds off DMV and NJ. NEFSC surveys in the 1970s and 1980s extended to Cape Hatteras. With low survey catches and no commercial fishery south of DMV, this area has been surveyed less intensively since the late 1990s.

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1 Available at: http://www.nefsc.noaa.gov/nefsc/publications/crd/crd0710/.

2 Available at http://www.nefsc.noaa.gov/nefsc/publications/crd/crd0703/

3 Available at: http http://www.nefsc.noaa.gov/femad/ecosurvey/mainpage/

Tables

Table A1. Decision table showing probabilities of a simulated surfclam stock with total biomass (120+ mm) at or lower than the target level (B_{Target}=B_{1999}/2), at or lower than the threshold level ($B_{Threshold}$=B_{Target}/2), and with fishing mortality rates at or higher than the threshold level ($F_{Threshold}$=M) during 2015. The analysis examines nine states of nature and four possible management approaches. Probabilities for states of nature are described as Low, Medium or High. The column "Pattern ID for dredge efficiency" is to help readers make comparisons among rows.

States of nature			Management actions				
Natural mortality	Survey dredge efficiency	Probability for state of nature	FMP minimum	Industry estimate	FMP maximum	F_{MSY} proxy	Pattern ID for dredge efficiency
Probability of stock biomass below B_{MSY} proxy target level in 2015							
Low	Low	Low	0	0	0	0.612	
Low	Medium	Medium	0	0	0	0.982	
Low	High	Low	0	0	0.004	1	
Medium	Low	Medium	0	0	0	0.91	
Medium	Medium	High	0	0	0.002	0.952	
Medium	High	Medium	0.006	0.012	0.014	0.998	
High	Low	Low	0	0	0	0.618	
High	Medium	Medium	0	0.002	0.002	0.924	
High	High	Low	0	0.002	0.018	0.984	
Probability of stock biomass below $B_{Threshold}$ level in 2015							
Low	Low	Low	0	0	0	0	
Low	Medium	Medium	0	0	0	0	
Low	High	Low	0	0	0	0.894	
Medium	Low	Medium	0	0	0	0	
Medium	Medium	High	0	0	0	0.002	
Medium	High	Medium	0	0	0	0.268	
High	Low	Low	0	0	0	0	
High	Medium	Medium	0	0	0	0	
High	High	Low	0	0	0	0.294	
Probability of overfishing in 2015							
Low	Low	Low	0	0	0	0.908	
Low	Medium	Medium	0	0	0	1	
Low	High	Low	0	0	0	1	
Medium	Low	Medium	0	0	0	0.312	
Medium	Medium	High	0	0	0	0.948	
Medium	High	Medium	0	0	0	1	
High	Low	Low	0	0	0	0.002	
High	Medium	Medium	0	0	0	0.196	
High	High	Low	0	0	0	0.996	

Figures

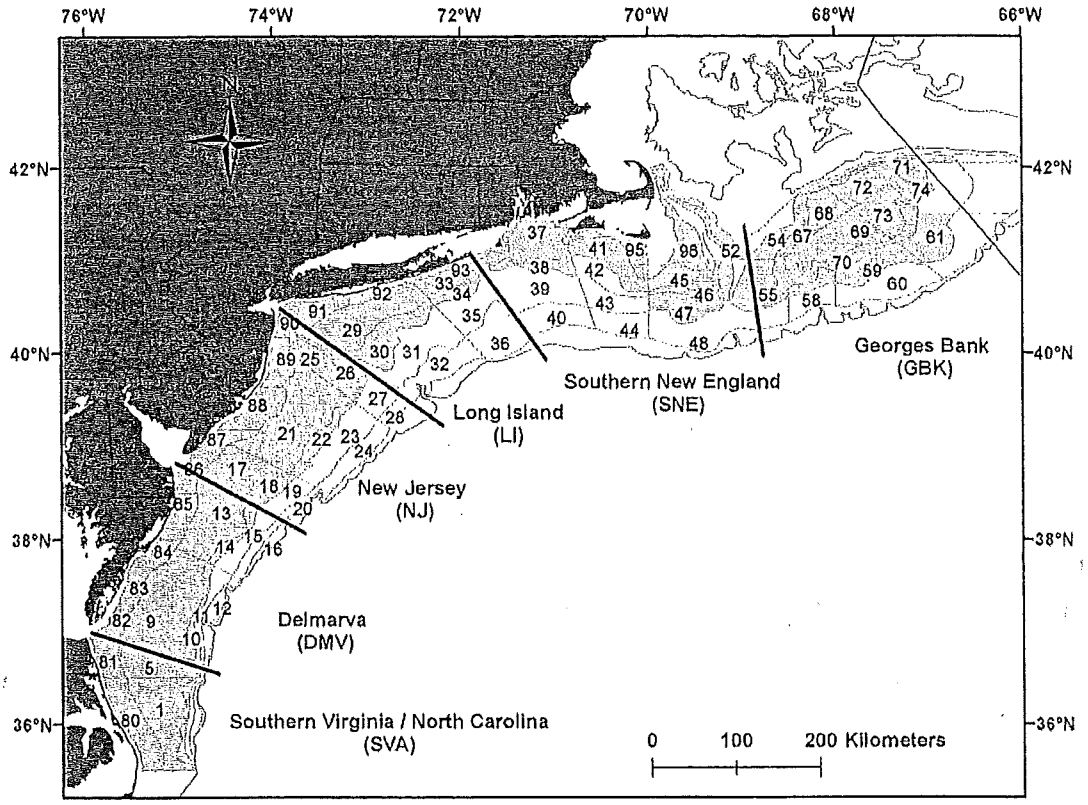


Figure A1. Assessment regions for the Atlantic surfclam stock in the US Exclusive Economic Zone (EEZ). NEFSC shellfish strata with potential surfclam habitat are shown in grey and identified by stratum ID numbers.

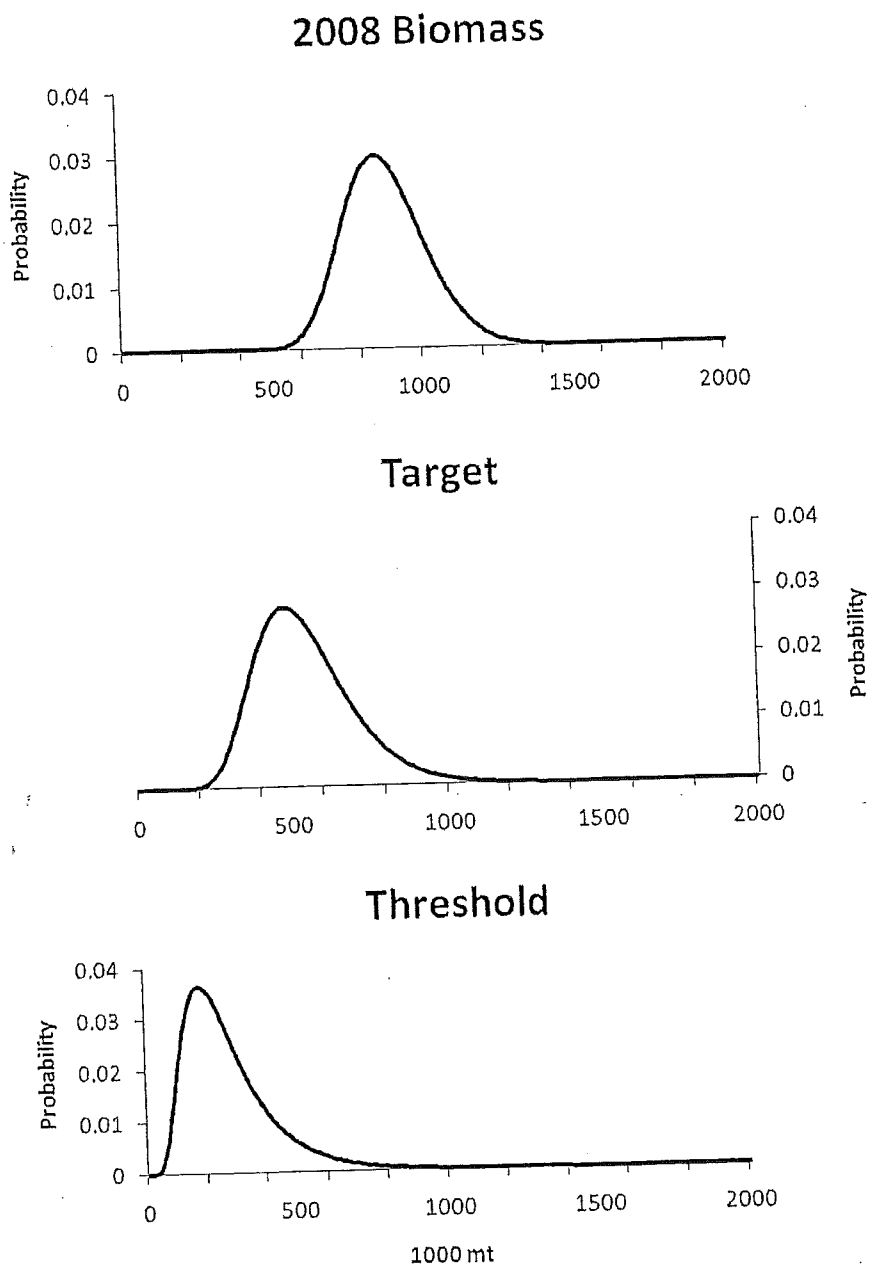


Figure A2. Probability density functions for estimated stock biomass (120+ mm SL) of surfclams during 2008, the estimated biomass target and the estimated biomass threshold.

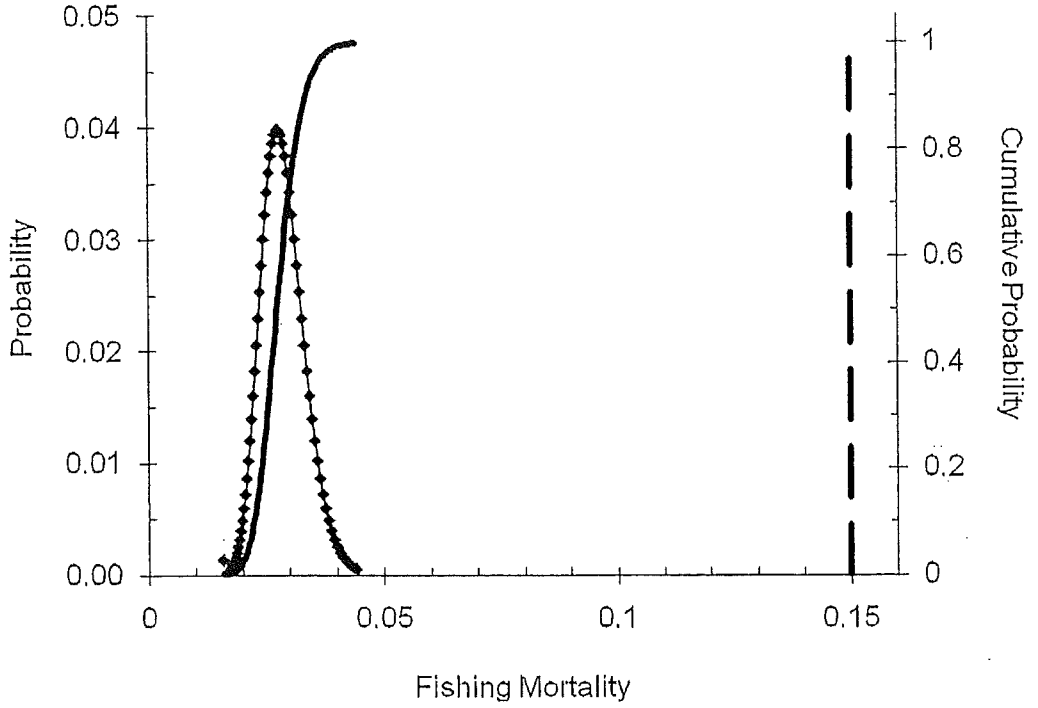


Figure A3. Estimated surfclam fishing mortality rate and confidence interval for 2008. The vertical line shows the fishing mortality threshold ($F_{Threshold}$ = M = 0.15) for comparison.

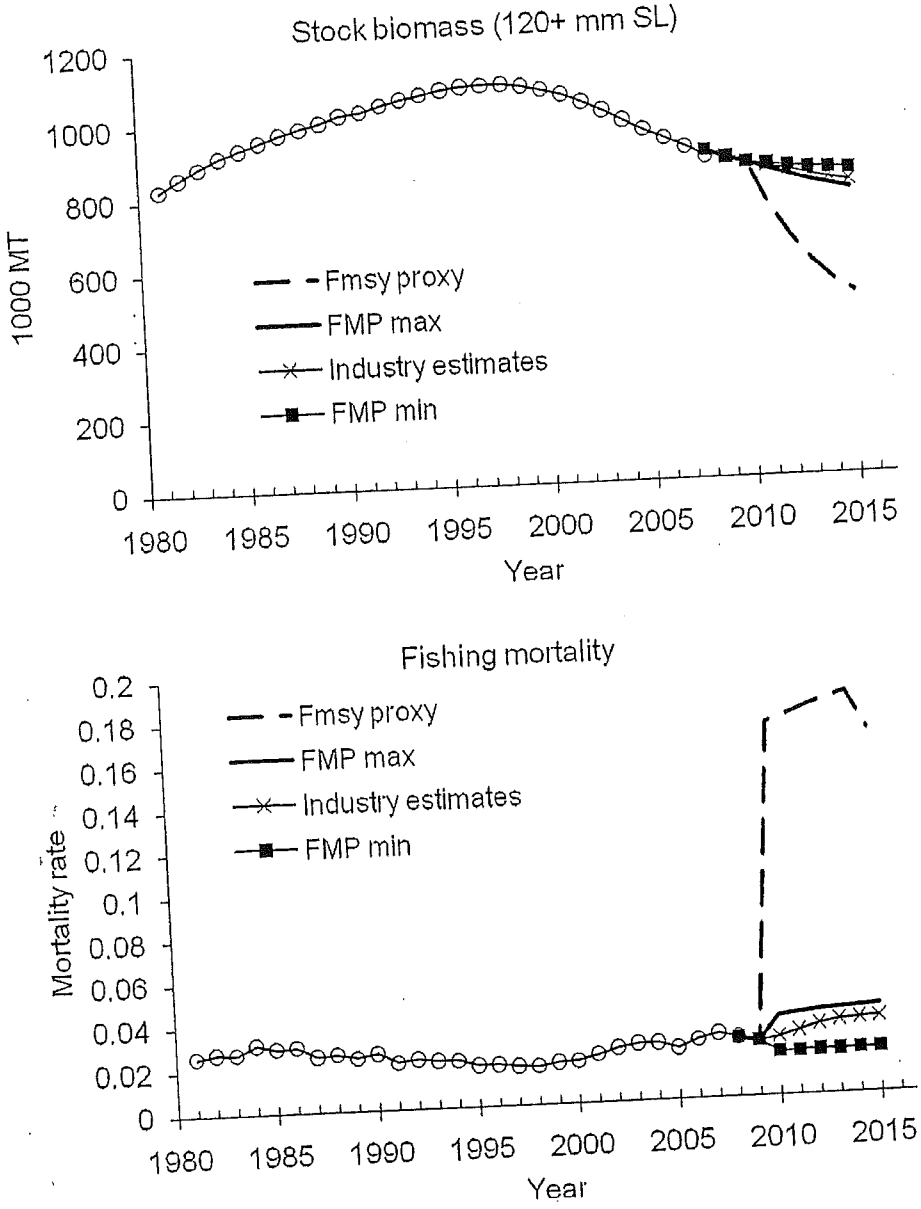


Figure A4. Basecase biomass and fishing mortality estimates for 1982-2008 from the KLAMZ model for the entire stock of surfclams, with projections for 2009-2015 assuming four harvest policies.

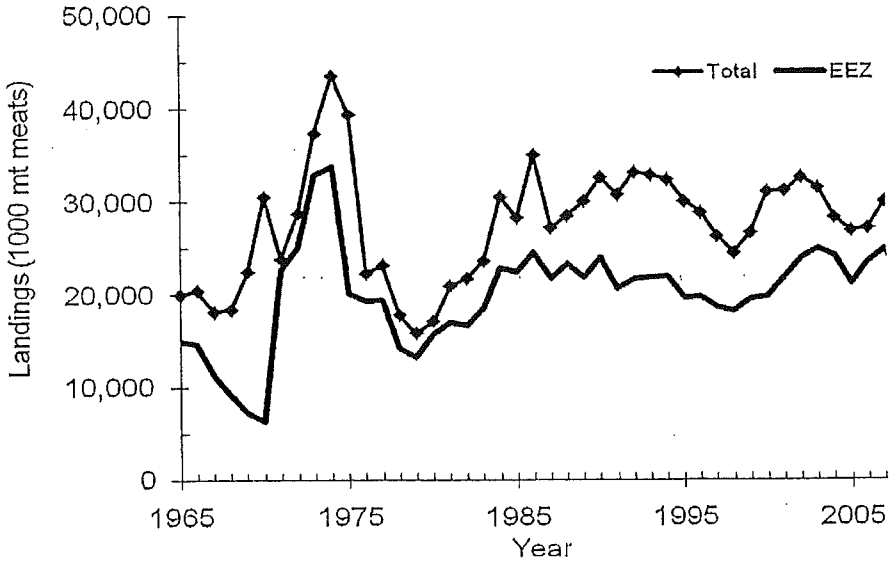


Figure A5. Surfclam landings (total and EEZ) during 1965-2008.

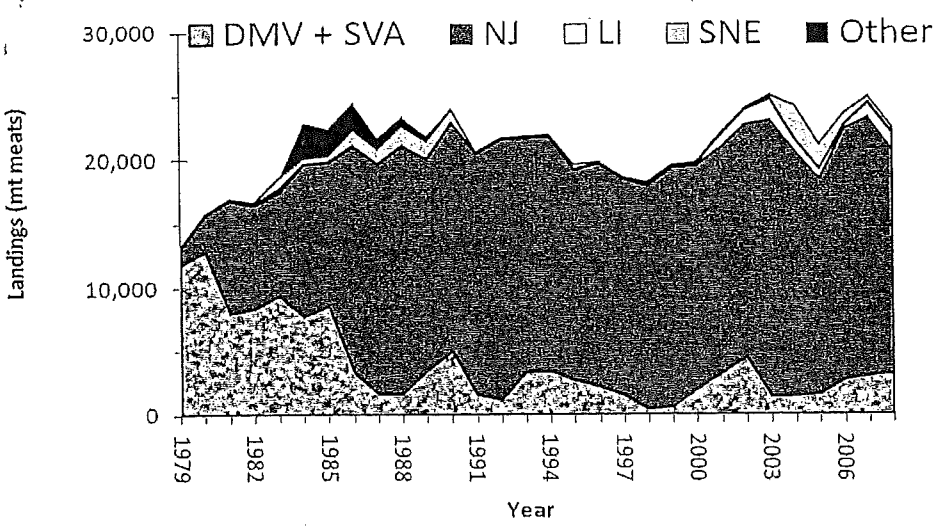


Figure A6. Surfclam landings from during 1979-2008 by stock assessment region.

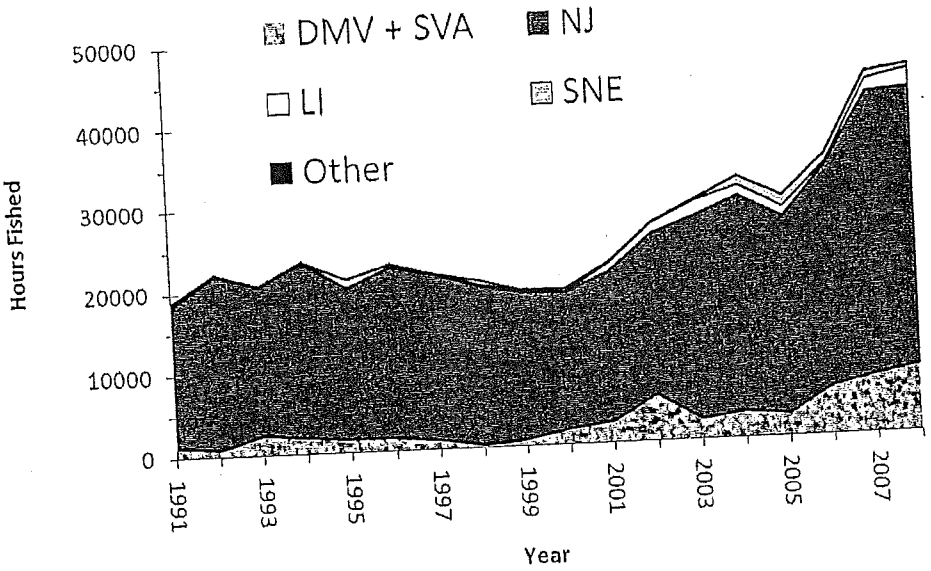


Figure A7. Total fishing effort (hours fished during all trips by all vessels) for surfclam during 1991-2008 in the US EEZ, by stock assessment region.

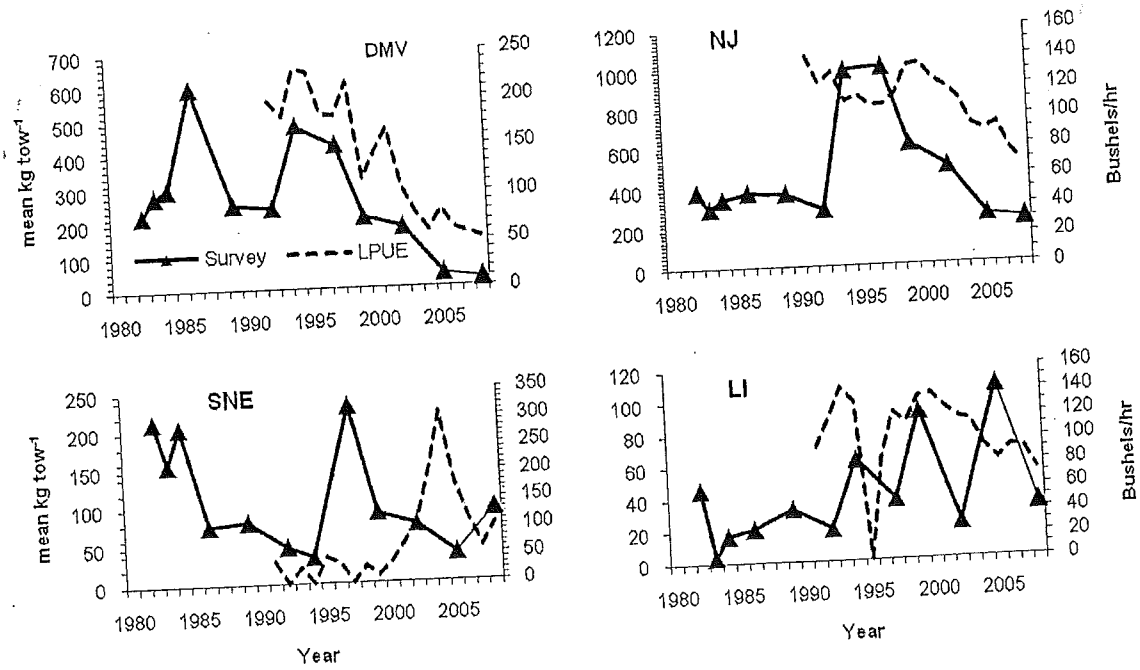


Figure A8. Trends in stock biomass for surfclams (120+ mm SL) based on the NEFSC clam survey and commercial LPUE from logbooks.

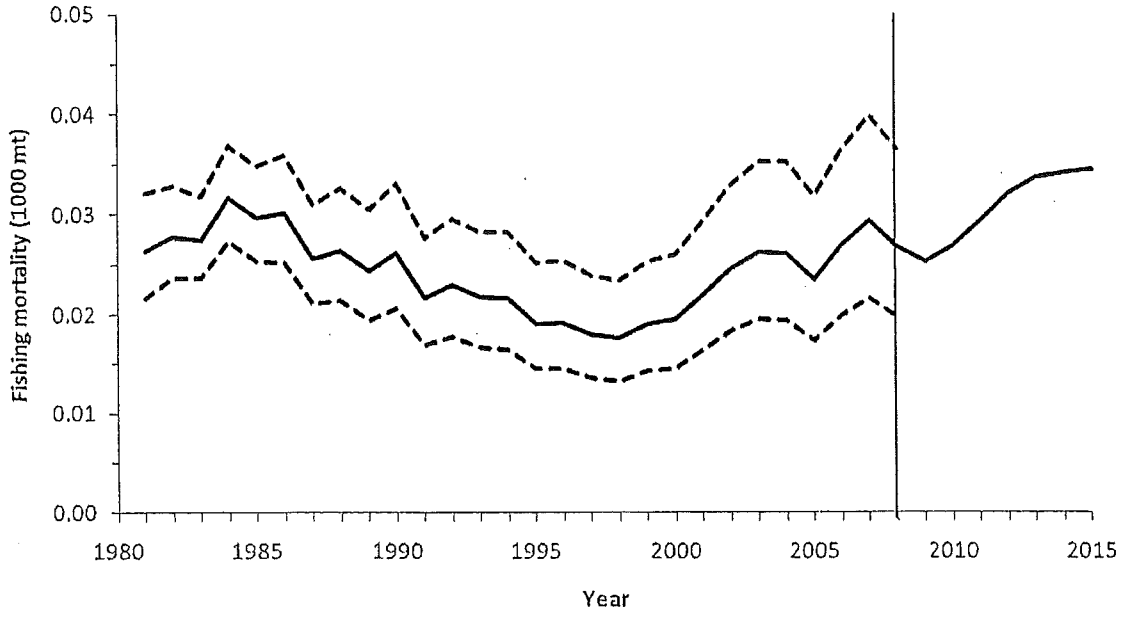


Figure A9. Fishing mortality estimates for surfclam with approximate 80% confidence intervals with projections through 2015 based on industry estimates for landings.

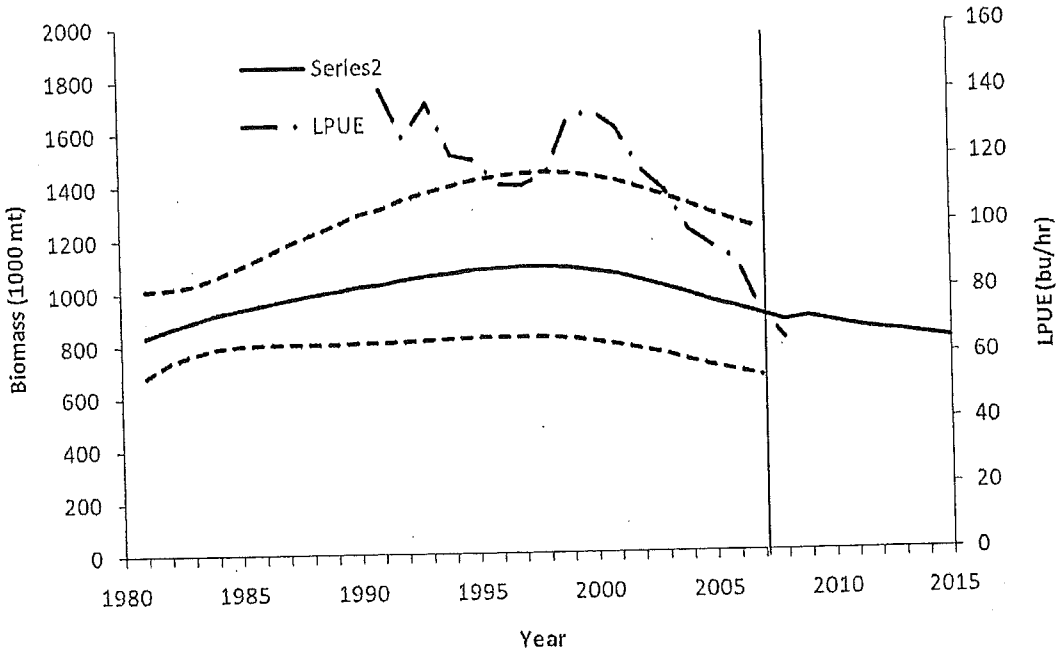


Figure A10. Surfclam biomass estimates (labeled "Series2") with approximate 80% confidence intervals. Nominal commercial LPUE from logbooks (total reported landings / total reported hours fished, all vessels and all trips) for the entire fishery (not including GBK where fishing did not occur) are shown for comparison. LPUE data were not used in estimating biomass. Projections to 2015, based on industry estimates of landings, are also shown.

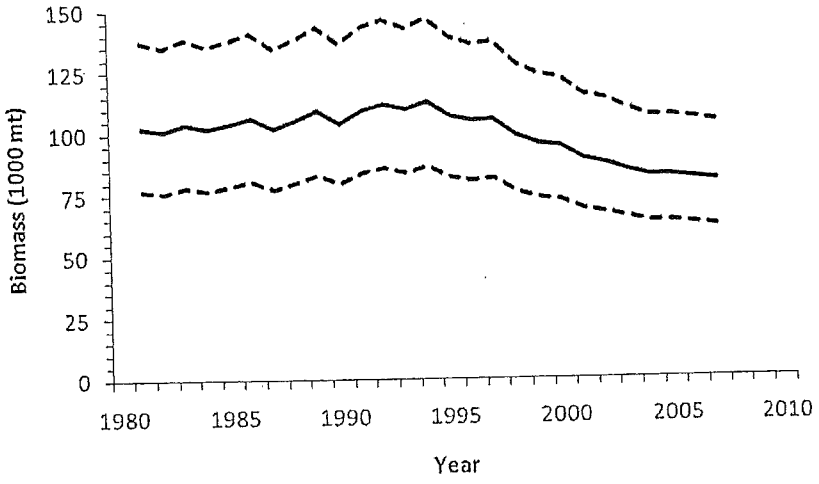


Figure A11. Surfclam recruit biomass estimates with approximate 80% confidence intervals.

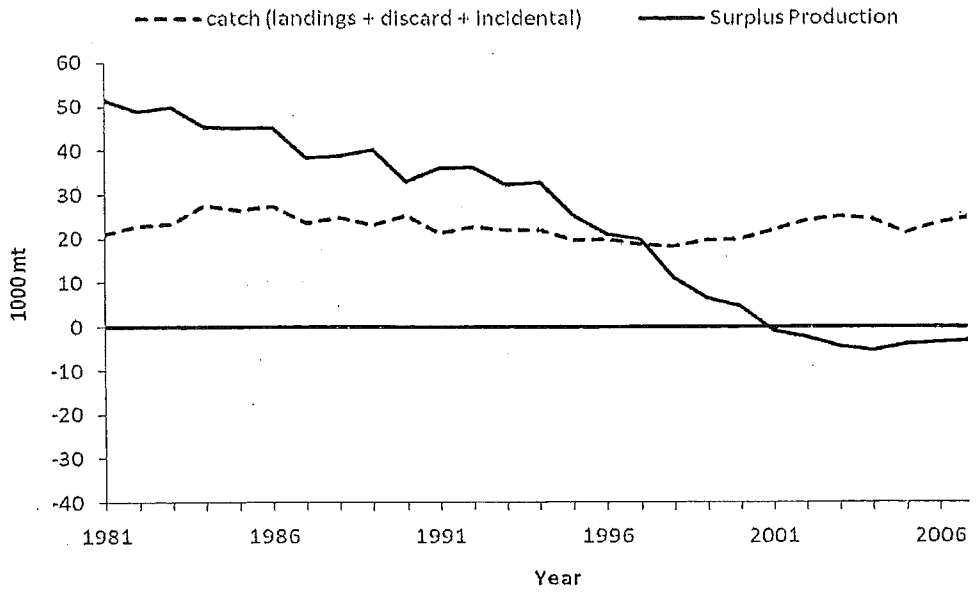


Figure A12. Estimated surfclam catch and surplus production by year.

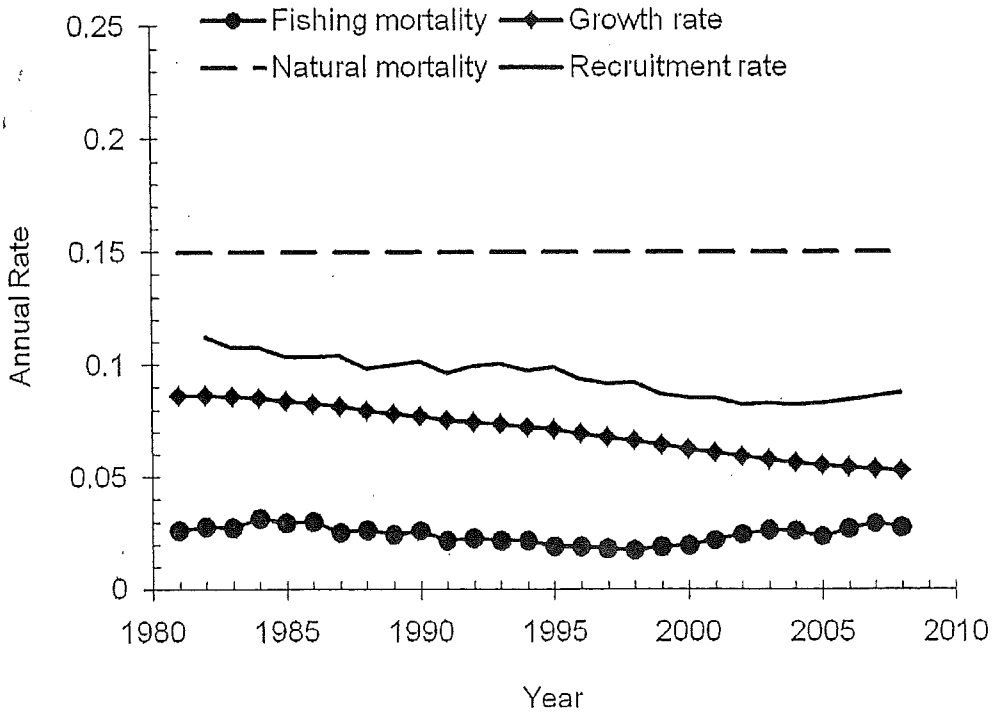


Figure A13. Estimated annual rates (e.g. the recruitment rate is based on the ratio of recruitment and stock biomass) of gain and loss for surfclam during 1982-2008.

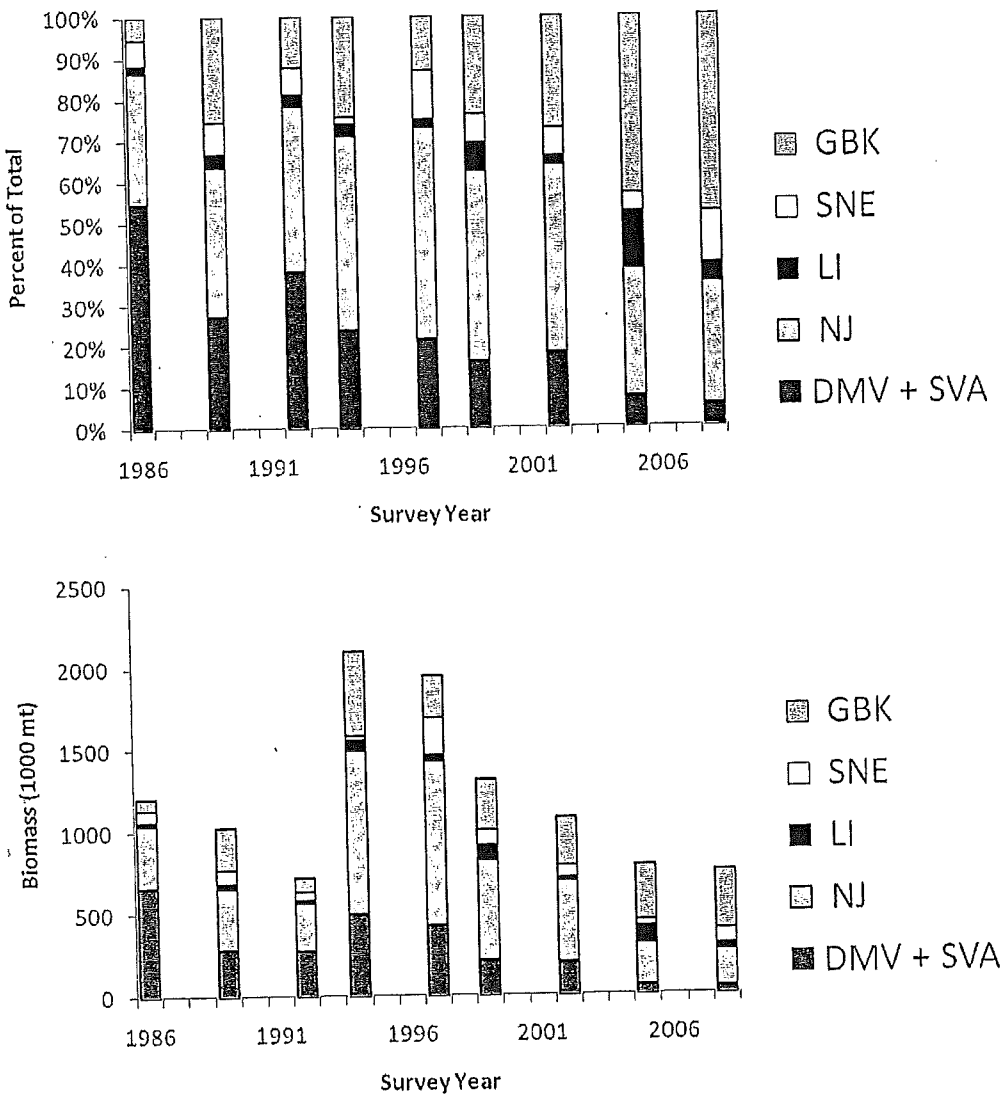


Figure A14. Efficiency corrected swept area biomass estimates for surfclams (120+ mm SL), by region, during years with NEFSC clam surveys.

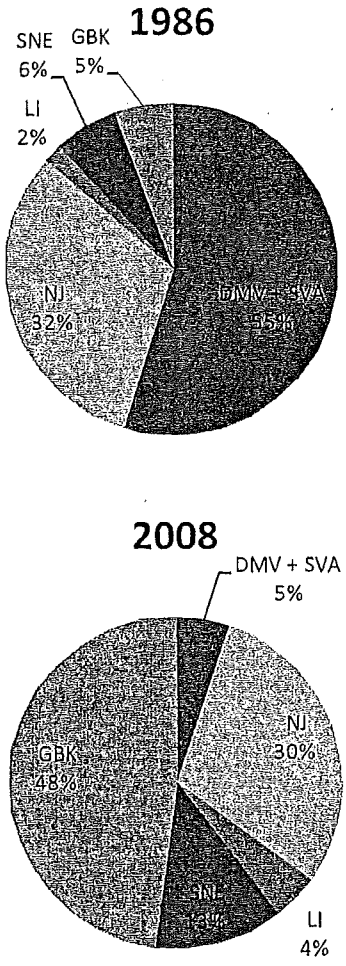


Figure A15. Percentage of efficiency corrected swept area biomass, by region, for surfclams (120+ mm SL) during 1986 and 2008.

B. OCEAN QUAHOG ASSESSMENT SUMMARY FOR 2009

State of the Stock:

The ocean quahog stock is not overfished and overfishing is not occurring (Figure B4). Estimated fishable (based on fishery selectivity curve) whole stock biomass during 2008 was 2.905 million mt of meats, which is above the SARC48 recommended management target of ½ of the 1978 pre-fishery biomass = 1.790 million mt. Estimated fishing mortality during 2008 for the exploited region (all areas but Georges Bank, Figure B1) was $F = 0.0102\ y^{-1}$, and for the whole stock $F = 0.0056\ y^{-1}$. Both F estimates are less than the new SARC48 recommended fishing mortality threshold ($F_{45\%} = 0.0219\ y^{-1}$) and the current fishing mortality threshold ($F_{25\%} = 0.0517\ y^{-1}$). These estimates for ocean quahog in the US Exclusive Economic Zone (EEZ) do not include the Maine fishing grounds, which were assessed separately (see below). However, biomass and landings for Maine waters are minor and would have no appreciable effect on estimates for the stock as a whole.

In this report, "fishable" quahogs are large enough to be available to the commercial fishery, based on a size selectivity curve for commercial fishing gear. The "exploited region" is used to describe the geographic area over which the fishery currently takes place and is a portion of the "whole stock". The whole stock is not currently exploited, as the Georges Bank area (which contains an estimated 45% of the quahogs in the EEZ) has been closed to ocean quahog fishing due to PSP concerns. At this time the exploited region consists of the Southern Virginia/North Carolina, Delmarva, New Jersey, Long Island and Southern New England areas (Figure B1). Currently, the fishing mortality reference points are compared to the fishing mortality levels in the exploited region only (see Special Comments). Industry sources report that fishing may occur on Georges Bank in the future (see Special Comments).

Projections:

Table B1 shows a summary of stochastic projection results for ocean quahog stock biomass and fishing mortality in 2015 assuming natural mortality M=0.02 and a variety of harvest policies. Projection results indicate that overfished (low biomass) stock conditions are not likely to occur by 2015 under any of the states of nature or management policies considered in projections. Overfishing (F too high) is unlikely to occur in 2015 at status-quo (3.8 million bu) or at the current FMP minimum (4 million bu) landings levels. However, there is some probability of overfishing in 2015 for landings as high as the current quota (5.33 million bu) or current FMP maximum level (6 million bu, Table B1), particularly when F is calculated for just the exploited stock. The probability of overfishing occurring in 2015 is high under many of the policies where constant quotas are based on an initial F, including the current target $F = F_{0.1}$ (Table B1).

More generally, KLAMZ model projections were run with varying "states of nature" that include a range of possible values for natural mortality (M=0.015, 0.02 and 0.025) and a distribution of possible 2008 biomass levels. The projections included runs with four landings-based policies (status quo landings, FMP minimum quota level, FMP maximum quota level, and FMP current quota) and five policies where the constant quota was based on an initial fishing mortality rate ($F_{0.1}$, $F_{25\%}$, $F_{40\%}$, $F_{45\%}$ and $F_{50\%}$). Both stochastic and deterministic projections were carried out (deterministic projections are not shown but approximate median values from stochastic projections). In Table B1 (bottom 6 rows), constant annual quotas from 2010-2015 were determined from particular F's applied to the 2008 biomass estimate. The results are

presented for both the exploited region and for the whole stock.

Catch and Status Table: Ocean Quahog

Year:	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Min[1]	Max[1]	Mean[1]
Quotas:[2]													
EEZ	20.4	20.4	20.4	20.4	20.4	22.7	24.2	24.2	24.2	24.2	13.6	27.2	21.5
Maine	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Landings:[2,5]													
Maine	0.28	0.36	0.33	0.39	0.36	0.31	0.30	0.37	0.31	0.2	0.003	0.39	0.21
EEZ	17.4	14.7	17.1	17.9	18.8	17.7	13.6	14.3	15.6	15.5	10.4	22.4	18.0
Total	17.7	15.1	17.4	18.3	19.2	18.0	13.9	14.7	15.9	15.7	10.4	22.5	18.1
Biomass:[3,5]	3,209	3,173	3,141	3,107	3,071	3,035	3,000	2,969	2,938	2,905	2,905	3,580	3,343
Fishing mortality (exploited stock)[5]:	0.0094	0.0081	0.0096	0.0103	0.0110	0.0106	0.0083	0.0089	0.0100	0.0102	0.0045	0.0110	0.0090
Fishing mortality (whole stock)[5]:	0.0056	0.0048	0.0056	0.0060	0.0063	0.0060	0.0047	0.0049	0.0055	0.0056	0.0031	0.0068	0.0056
Recruitment:[4,5]	16.1 (all years)												

[1] Min, max and means for 1978-2008 (EEZ landings, biomass and fishing mortality), 1979-2008 (EEZ quota), 1990-2008 (Maine landings and quota.

[2] Landings and quotas (1000 mt meats) not adjusted for incidental mortality, which is assumed to be 5% of landings. Discards are very low.

[3] Biomass (1000 mt meats) for entire stock.

[4] Recruitment (1000 mt meats per year) is an estimated average assuming zero recruitment in SVA and DMV.

[5] See assessment for regional estimates.

Stock Distribution and Identification:

Ocean quahogs occur in the eastern Atlantic Ocean from Spain to Norway, intermittently across the North Atlantic, around Iceland, and down the North American coast to Cape Hatteras. Commercial concentrations occur in US waters on the continental shelf off the coast of Maine and from Georges Bank and the Delmarva Peninsula (Figure B1) relatively cool water from 25 to 95 meters in depth.

All ocean quahogs in US waters are assessed and managed as a single stock. The EEZ portion of the ocean quahog stock includes federal waters (between 3 and 200 nm from shore) off southern Virginia, Delmarva, New Jersey, Long Island, Southern New England, and on Georges Bank (excluding Maine). The EEZ is used to characterize the condition of the ocean quahog stock as a whole because almost all of the stock (>99% of fishable biomass) is in EEZ waters.

Catches:

EEZ quotas have been set on an annual basis since 1979. EEZ landings (Figure B2) increased from 0 in 1975 to about 14,000 mt of meats in 1979, peaked at 22,000 mt in 1992, declined to about 15,000 mt during 2000, and have averaged about 16,000 mt since 2000. EEZ landings account for about 95% of total US landings on average. The EEZ quota has not been filled in recent years due to low market demand, according to Industry sources. Ocean quahogs landed in the EEZ range from 50 to120 mm SL and are marketed primarily as meats for use in the manufacture of commercial chowders and sauces.

Catch is assumed to be 5% greater than landings in stock assessment calculations for ocean quahogs in EEZ and Maine waters to account for incidental mortality during fishing. Incidental mortality may occur when ocean quahogs contact fishing equipment (i.e. dredge and

sorting equipment) without being landed.

Fishing effort for ocean quahogs in the EEZ increased from about 23,000 mt during 1983 to a peak of about 46,000 hours during 1991 and then declined to about 25,000 hours in 2008 (Figure B3). Fishing effort in the EEZ shifted offshore and north during the last two decades as traditional fishing grounds in the south were fished down, catch rates dropped, and as processing plants were relocated to the north (Figure B3). The fishery was concentrated off Delmarva and Southern New Jersey from the 1970s to mid-1980s. During the late 1980s and early 1990s, the fishery expanded northward into the Northern New Jersey and Long Island regions. In 1995, it expanded to the Southern New England region which accounted for the bulk of landings during 1997. Since then the fishery has been concentrated mostly off Long Island.

There are two principal fishing grounds for ocean quahogs in Maine waters, the east bed and the west bed, which cover about 60 nm^2 in total. Total annual landings in Maine waters reached a peak of 387 mt in 2002, since then landings have declined to 201 mt in 2008. Fishing effort in Maine waters peaked during 2004 at about 19,000 hours per year and then declined to about 11,000 hours per year during 2008. Ocean quahogs harvested from Maine waters are small in size compared to those harvested in the EEZ. Ocean quahogs in the Maine fishery range from 35 to 70 mm SL, and are marketed in the fresh and half-shell market at relatively high prices.

Data and Assessment:

Ocean quahogs were last assessed in 2006 (SAW-44), after the 2005 NEFSC clam survey (NEFSC 2007). The 2009 assessment uses new data from the 2008 NEFSC and cooperative Industry clam surveys. A new survey of the Maine fishing grounds by the Maine Department of Natural Resources was also conducted in 2008 and also used in this assessment.

EEZ:

NEFSC clam survey data for 1982-2008, fishery data for 1978-2008, and new information about survey dredge efficiency from cooperative depletion studies were used to estimate fishable biomass during 1978-2008. Estimates for most regions (all but Southern Virginia) were from a delay-difference model (KLAMZ). A cumulative catch ("VPA") model was used in place of KLAMZ to estimate biomass and fishing mortality for Southern Virginia because data were insufficient for complicated approaches.

Maine:

Landings, surveys carried out by the State of Maine, and survey dredge efficiency estimates were used to estimate biomass and fishing mortality of ocean quahogs in Maine waters during 2005 through 2008. The estimates for Maine apply only to the area surveyed, which includes the primary fishing grounds.

Biological Reference Points:

Target and threshold reference points were reconsidered during this assessment because of the unique life history of ocean quahogs. The previously accepted (i.e. current) management targets are B_{MSY} = one-half of virgin biomass and the F_{MSY} proxy $F_{0.1} = 0.0277\ y^{-1}$ in the exploited region, which excludes Georges Bank. The previously accepted (i.e. current) management thresholds are $B_{Threshold} = 25\%$ of virgin biomass (1/2 B_{MSY}) for the whole stock, and $F_{Threshold} = F_{25\%}$ ($0.0517\ y^{-1}$) in the exploited region only.

Based on a review of F_{MSY} reference points of long-lived West Coast groundfish species, the new SARC48 recommended $F_{Threshold}$ is $F_{45\%} = 0.0219\ y^{-1}$ (see Special Comments). The new recommended reference points are not referred to as MSY reference points because the potential productivity of the ocean quahog stock under fishing is unknown (see Special Comments). The new SARC48 recommended biomass target of 1.790 million mt is one-half of the 1978 pre-fishery biomass (virgin biomass is not used because it probably fluctuated and is hard to estimate). The new SARC48 recommended $B_{Threshold}$ is 40% of the 1978 pre-fishery biomass (1.432 million mt). This recommended $B_{threshold}$ is *ad hoc*, but it is probably better than the current biomass reference point both in relation to $F_{45\%}$ and in maintaining a productive stock for the long term.

Fishing Mortality:

$F = 0.0100\ y^{-1}$ during 2008 for the exploited region of the EEZ (excluding GBK). For the whole stock during 2008, $F = 0.0056\ y^{-1}$ (Figures B4 and B5).

Recruitment:

Mean annual recruitment to the fishable stock was low (<1% per year during 2008). A pulse of recruitment in LI has finished growing to fishable size, based on survey data collected during 2008. Survey size frequency data in 2008 indicate an increasing number of pre-recruits in parts of SNE and GBK. Recruitment of these individuals to the fishable stock is expected to occur over the next decade.

Stock Biomass:

Fishable stock biomass during 2008 was 2.905 million mt of meats for the whole stock. Estimated fishable biomass in 1978 was 3.580 million mt. The ocean quahog population is an unproductive stock that is being fished down from its pre-fishery level. After several decades of relatively low fishing mortality, the stock is still above the current and newly recommended biomass target reference points (Figure B4).

Based on current survey data, LPUE data and biomass estimates from 1977-2008, declines in stock biomass are most pronounced in southern regions (Figures B6 and B7). In particular, stock biomass is below one-half of the 1978 level in the Southern Virginia, Delmarva, and New Jersey regions.

The LI, SNE and GBK regions in the north contained about 67% of total fishable biomass during 1978 and contained about 84% of the total fishable biomass during 2008. The GBK region, which is currently not fished due to risk of PSP contamination, contained about 33% of total fishable biomass during 1978 and about 45% during 2008. The proportion of the stock resident in high density areas has been reduced over time by fishing. Density levels are highest on GBK, where no fishing is currently allowed and lowest in southern areas (DMV and NJ) where the fishery began in the 1980s (Figure B6).

Fishable biomass in Maine waters was estimated to be 16,574 mt and fishing mortality was estimated to be $F = 0.021\ y^{-1}$ during 2004. Logbook data show that fishing effort has declined since the peak of 19,000 hrs in 2002 to about 11,000 hours in 2008. Since 2000, LPUE for Maine waters has fluctuated without an overall trend (Figure B8).

Special Comments:

* Industry sources report progress in developing reliable, inexpensive and quick tests for possible PSP contamination and are negotiating with the Food and Drug Administration to potentially begin fishing on Georges Bank, possibly beginning in 2009.
* Ocean quahogs (including Georges Bank) may or may not have the potential for supporting sustainable catches in the long term. Some recruitment and growth occurs each year but at low levels. Much depends on the response of the stock on Georges Bank to fishing, where growth and potential recruitment rates are relatively high. It is probably not possible to maintain a sustainable fishery on the currently exploited region where recruitment and growth rates are very low.
* It is technically valid and probably constructive to view the ocean quahog fishery and fishing on Georges Bank is as an adaptive management experiment. The stock (including Georges Bank) may or may not support a sustainable fishery. The answer to the question of sustainability might be determined after a decade or two of fishing on Georges Bank, and managers should be prepared to react in either case. Policy and management actions in the event the fishery is not sustainable should be considered carefully beforehand. One obvious option would be to discontinue fishing, for ocean quahogs, potentially for a decade or more, if stock biomass reaches its biomass threshold.
* In conducting the adaptive management experiment, it is important that removal rates are low enough to provide one or two decades for increased recruitment following fishing because the lag time between spawning and recruitment to the fishery is relatively long. At high fishing mortality rates, it would be theoretically be possible to eliminate the spawning biomass before recruitment has a chance to occur.
* Academic, industry and NEFSC personnel have devoted considerable effort to estimating efficiency of the NEFSC clam survey dredge during the 1997-2008 surveys. Considerable progress was made since the last assessment but survey dredge efficiency remains a chief source of uncertainty. Collaborative depletion studies designed to measure dredge efficiency should continue to be part of each clam survey.
* The current fishing mortality thresholds are compared to the fishable stock which excludes GBK. The assessment makes no recommendation as to whether the recommended fishing mortality threshold should be compared to the fishable stock or the whole stock because this is a policy question. However, from a technical point of view, mortality rates calculated for the whole stock including Georges Bank do not describe conditions on either the exploited portion or unexploited portions of the stock. In particular, fishing mortality may be higher than desired on the exploited portion (resulting in foregone yield and relatively low biomass conditions) and zero on the unexploited portion (resulting in foregone yield). Levels of sustainable catch are lower than MSY for stocks with large areas where no fishing occurs. Regardless of stock structure, regional and spatially explicit management practices will tend to maximize yield and maintain adequate stock biomass levels for sessile stocks like ocean quahogs.
* Information about indirect mortality due to fishing (currently assumed to be 5% of landings) is uncertain. Indirect mortality may be significant in Maine waters where fishing effort levels per unit area are high.
* This species is potentially vulnerable to overfishing due to its low productivity. Due to its low productivity and slow dynamics, the response in recruitment to current (and historical) fishing pressure will not be detectable for at least several decades.
* At current catch levels (which are <70% of the quota) there is a low probability that the

fishing mortality would exceed the SARC48 recommended $F_{Threshold}$ by 2015 for the exploited portion or whole stock and low probability that whole stock biomass would fall below the recommended $B_{Threshold}$. At other fishing mortality levels, such as the current F_{Target} ($= F_{0.1}$), there is a high probability of overfishing in the currently exploited stock by 2015. Some of the policies considered in simulations (e.g. the current $F_{Threshold} = F_{25\%}$) virtually guarantee that fishing mortality for the exploited and whole stock would exceed the recommended $F_{Threshold}$ by 2015.

References:

Dahlgren T, Weinberg J, Halanych K. 2002. Phylogeography of the ocean quahog (*Arctica islandica*): influences of paleoclimate on genetic diversity and species range. Mar Biol. 137: 487-495.

Murawski SA, Ropes JW, Serchuk FM. 1982. Growth of the ocean quahog, (*Arctica islandica*), in the Middle Atlantic Bight. Fish Bull. 80: 21-34.

NEFSC. 2007. Ocean quahog assessment. *In*: 44th Northeast Regional Stock Assessment Workshop (44th SAW): 44th SAW assessment report. NEFSC Ref Doc. 07-10. (Available online at : http://www.nefsc.noaa.gov/nefsc/publications/crd/crd0710/)

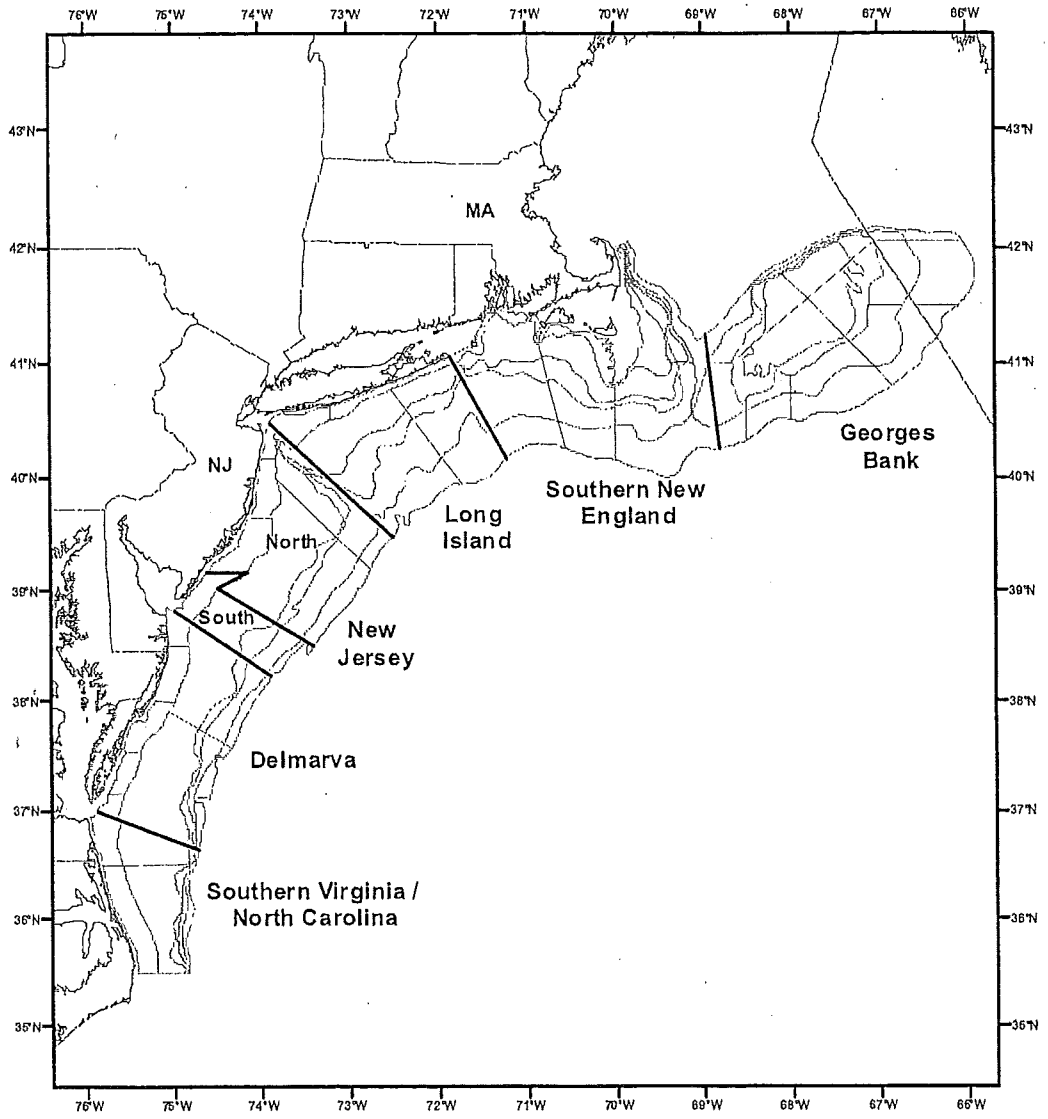
Powell E, Mann R. 2005. Evidence of recent recruitment in the ocean quahog (*Arctica islandica*) in the Mid-Atlantic Bight. J Shellfish Res. 24: 517-530.

Tables

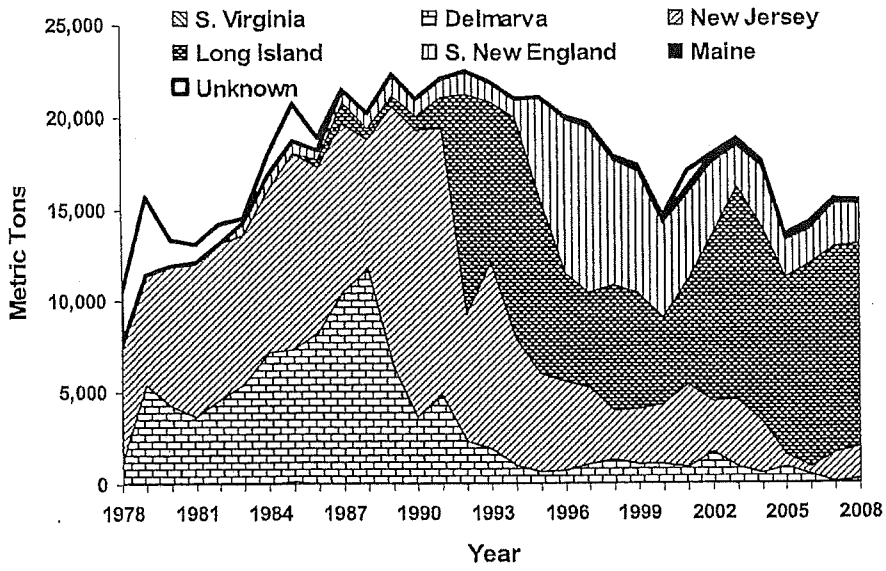
Table B1. Stochastic projection results for ocean quahogs in 2015 with natural mortality M=0.02 under various constant annual quotas during 2010-2015. Starting biomass levels in 2008 are from a bootstrap analysis with the KLAMZ model for ocean quahogs in the exploited area. Biomass on GBK was assumed constant at the 2008 estimate. Actual landings were used in simulations for 2008 and expected landings (3.8 million bushels or 17.2 mt meats) were used for 2009. For 2010-2015, there is a constant level of annual landings (quota) for each harvest policy, calculated by multiplying the target fishing mortality times the current best estimate of biomass during 2008, where the biomass estimate is for either the exploited or entire stock area. Simulated catches were equal to the quota plus 5% to account for incidental mortality. Probabilities of overfished stock conditions ($B_{2015} \leq$ the recommended $B_{Threshold}$) and probabilities of overfishing ($F_{2015} \geq$ the recommended fishing mortality threshold $F_{45\%}$) in 2015 are shown in the last three columns. The probability of overfishing is for either the exploited stock (F_{2015} for exploited stock $\geq F_{45\%}$) or the entire stock (F_{2015} for entire stock $\geq F_{45\%}$).

How are the landings calculated? (alternative management actions, under constant annual removal)	Annual landings 2010-2015 (million bushels)	Annual landings 2010-2015 (1000 mt meats)	Probability overfished in 2015 ($B_{2015} \leq B_{Threshold}$)	Probability of overfishing for exploited stock in 2015 (F_{2015} for exploited stock $\geq F_{45\%}$)	Probability of overfishing for entire stock in 2015 (F_{2015} for entire stock $\geq F_{45\%}$)
Status quo landings	3.8	17.2	0	0.00	0.00
Current quota	5.3	24.2	0	0.19	0.00
FMP min landings	4.0	18.1	0	0.00	0.00
FMP max landings	6.0	27.2	0	0.54	0.00
Recommended F threshold ($F_{45\%}$) x 2008 biomass in exploited area	7.7	34.8	0	0.90	0.00
Current F target ($F_{0.1}$) x 2008 biomass in exploited area	9.7	44.0	0	0.99	0.00
Current F threshold ($F_{25\%}$) x 2008 biomass in exploited area	18.1	82.2	0	1.00	1.00
Recommended F threshold ($F_{45\%}$) x biomass in entire area	14.0	63.7	0	1.00	0.97
Current F target ($F_{0.1}$) x biomass in entire area	17.8	80.6	0	1.00	1.00
Current F threshold ($F_{25\%}$) x biomass in entire area	33.1	150.4	0	1.00	1.00

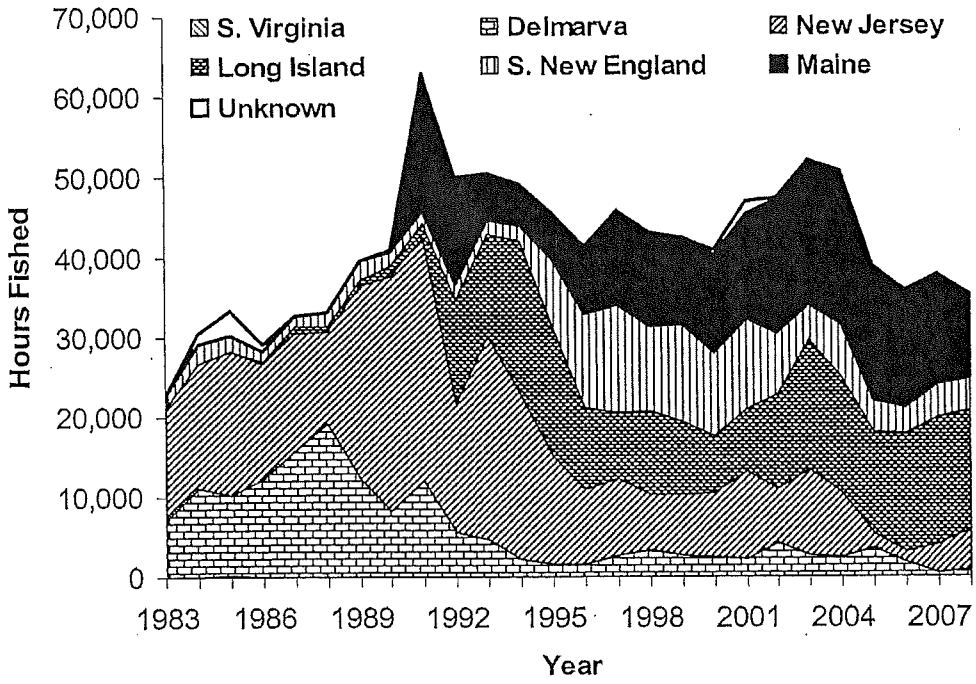
Figures



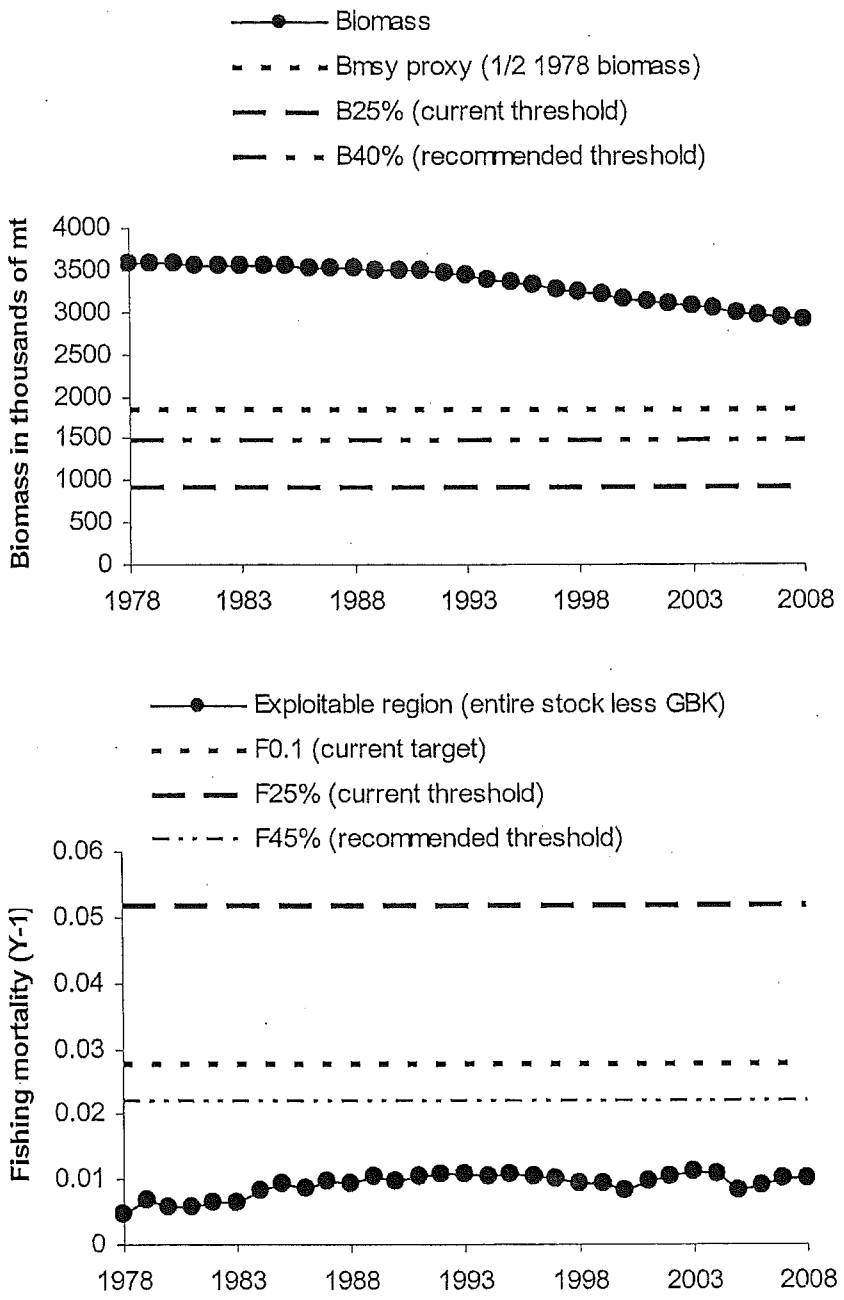
B1. Stock assessment regions for ocean quahogs in the US EEZ, with survey strata and stock assessment regions. For ocean quahogs, the southern and northern portions of the New Jersey region are combined. The Maine fishing area is off the Maine coast north of 43° 50' N.



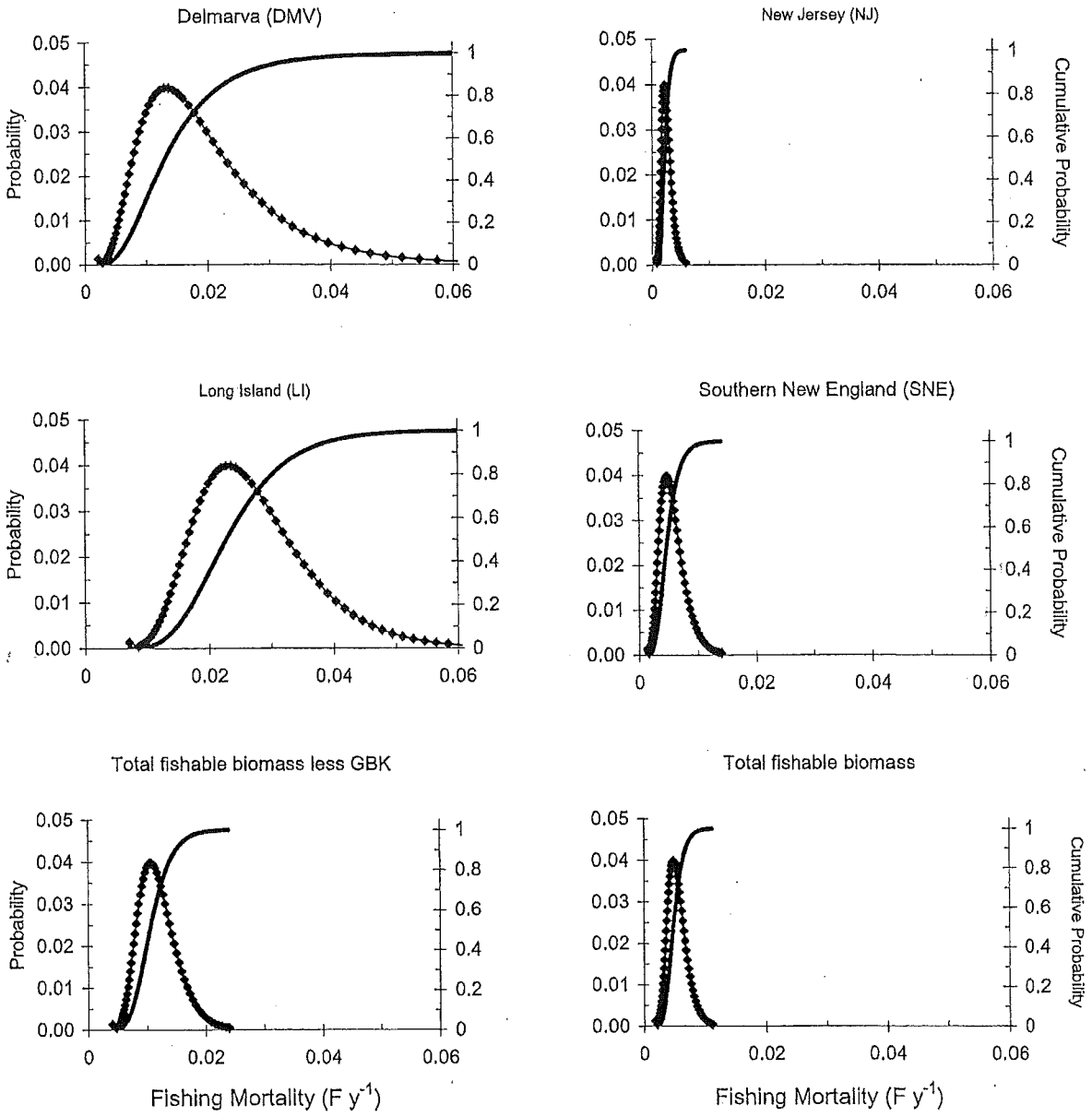
B2. Ocean quahog landings (mt meats) in the EEZ by region during 1978-2008. Figures for SVA are near zero and do not show clearly in plots.



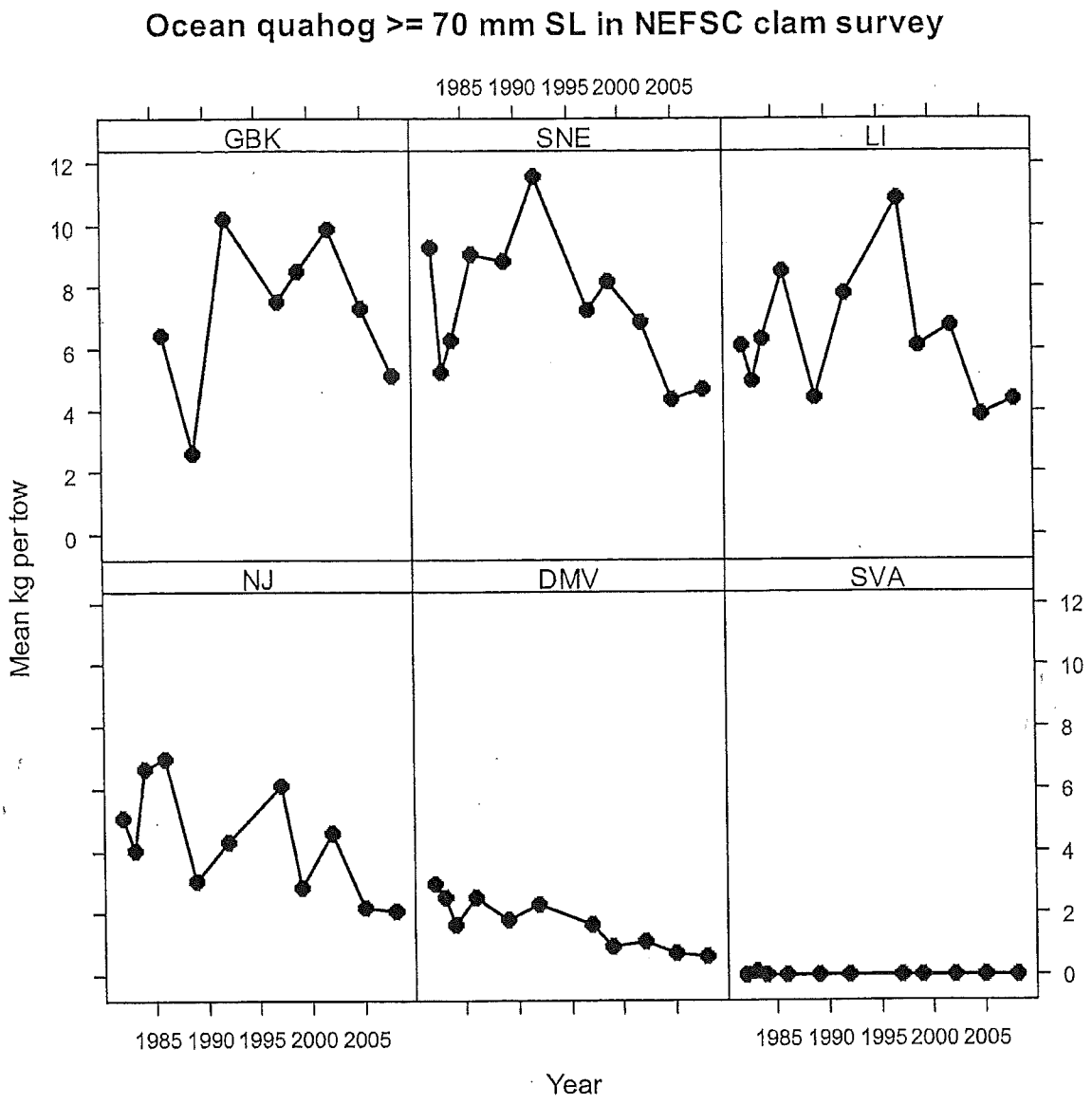
B3.Fishing effort (hours fished per year) for ocean quahog in EEZ and Maine waters during 1983-2008 calculated from mandatory logbook data. Figures for SVA are near zero and do not show clearly in plots.



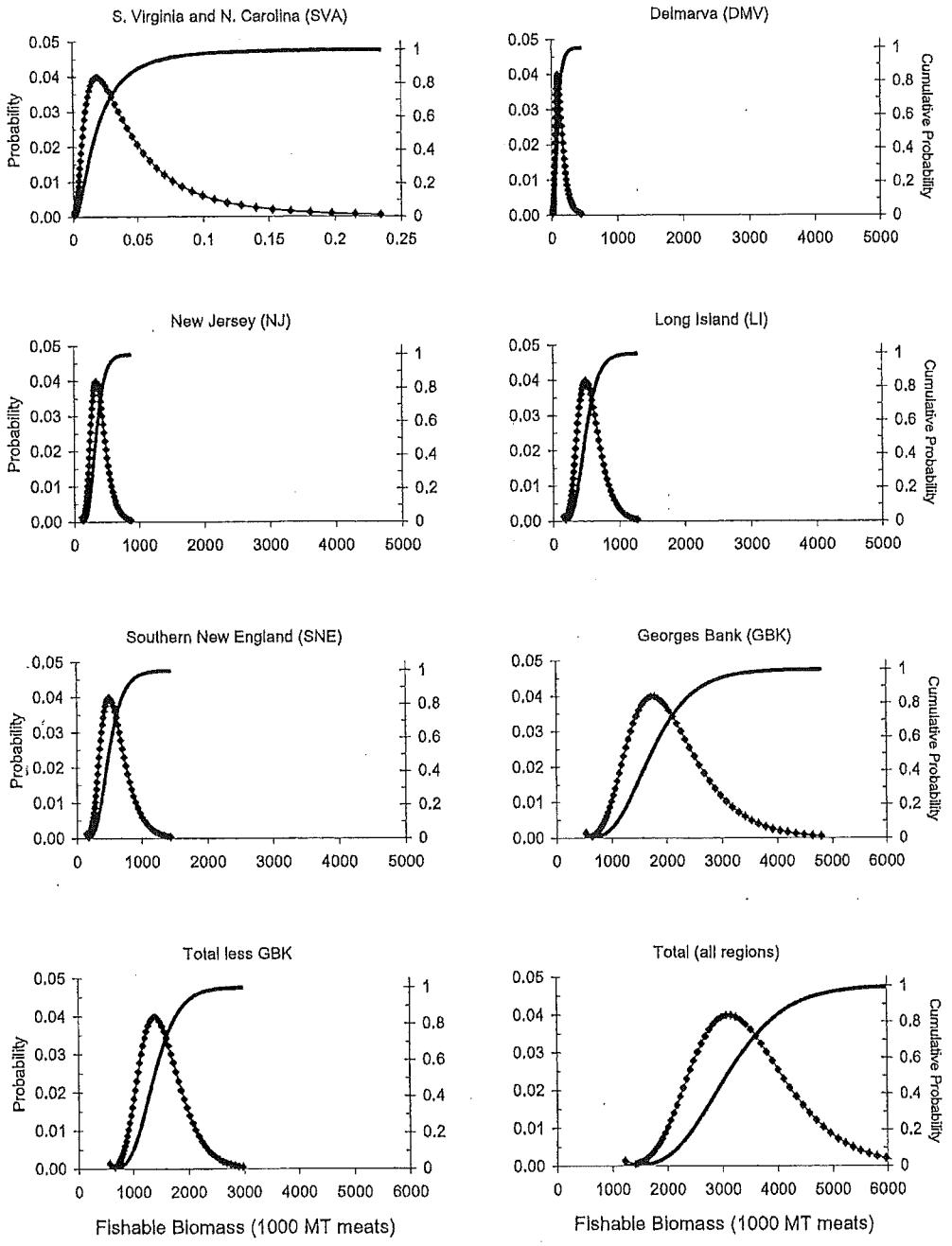
B4. Top: Estimated ocean quahog fishable biomass since 1978, based on sum of "best" regional estimates. Bottom: Estimated fishing mortality on the exploited portion of the stock since 1978. Both current and new SARC48 recommended reference points are shown as horizontal lines.



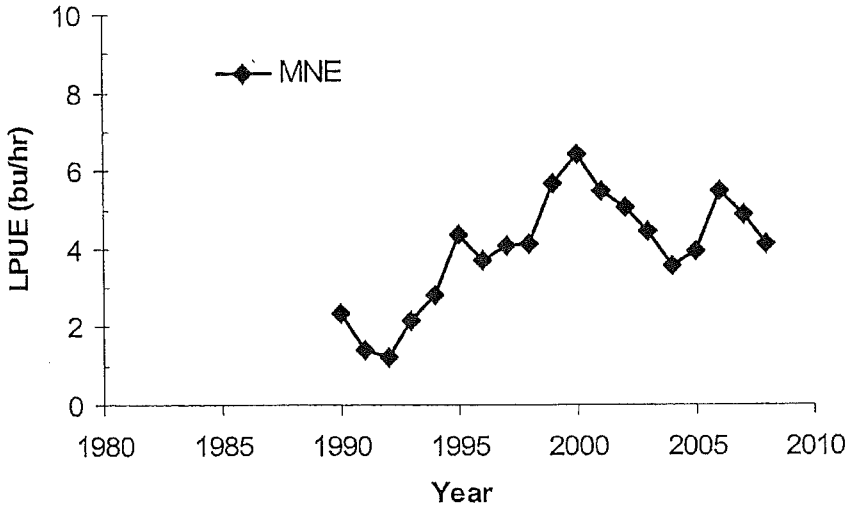
B5. Uncertainty in fishing mortality estimates for ocean quahog by region during 2008 based on catch data and efficiency corrected swept-area biomass. X-axes are scaled to the same maximum to facilitate comparisons.



B6. Trends in survey mean biomass per tow for large (≥70 mm SL) ocean quahogs, 1982-2008. Data from the 1994 survey are not shown because of voltage problems that affected catchability of the survey dredge. Sampling was relatively poor and estimate are less reliable for GBK during 1982-1984, 1989, 2002 and 2005; SNE during 1984 and 2005; LI during 1984; NJ during 1984; DMV during 2008; and in SVA during 1999 and 2008.



B7. Uncertainty in efficiency corrected swept area biomass (ESB) estimates by region for fishable ocean quahogs during 2008. Note that the x-axis differs in the panel for SVA but is the same in all other panels to facilitate comparisons.



B8. Ocean quahog LPUE (kg meats hr^{-1}) in Maine waters during 1990-2008.

STATE OF MAINE
DEPARTMENT OF MARINE RESOURCES
21 STATE HOUSE STATION
AUGUSTA, MAINE
04333-0021

PAUL R. LEPAGE
GOVERNOR

NORMAN H. OLSEN
COMMISSIONER

May 3, 2011

Mr. Rick Robins, Chairman
Mid-Atlantic Fishery Management Council
Suite 201
800 N. State St
Dover, DE 19901

Dear Rick,

I'm aware that the Ocean Quahog Committee and advisors will be discussing the 2012 specifications for the ocean quahog quota at the upcoming MAFMC meeting. I'm writing to provide you with the State of Maine's comments concerning the Maine Mahogany Quahog Fishery.

After reviewing the most recent stock assessment and the recent landings data, the State of Maine sees no reason to change the Maine Mahogany Quahog quota at this time. I'm requesting that the MAFMC continue the 100,000 bushel Maine Mahogany Quahog quota for the 2012 and 2013 specifications. The current landings are in line with the assessment, and the additional data points from the Department of Marine Resources recent survey will allow for more accurate future projections and subsequent adjustments as needed.

Thank you for allowing me the opportunity to comment and as always please contact me if you have any questions.

Regards,

Terry Stockwell
Director of External Affairs

cc: Dr. Christopher Moore
Dr. Thomas Hoff

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WALLACE &
ASSOCIATES

May 4, 2011

Dr. Thomas Hoff
Mid Atlantic Fisheries Management Council
Dover, DE

2012 Surfclam and Ocean Quahog Quotas

Dear Tom:

I am writing on behalf of Truex Enterprises regarding the setting of the surfclam and ocean quahog quotas for 2012. The Truex's suggest that the quotas for 2012 remain the same as 2011 of 3.4 and 5.333 million bushels respectively for surfclams and ocean quahogs. Since there has not been a survey or an assessment since the current quota was set, there is no new peer revjewed scientific information on which to base any changes. Therefore, in is logical to maintain the status quo for the surfclam and ocean quahog quotas for the coming year.

Thank you for your consideration in this matter.

Sincerely,

D. H. Wallace

David H. Wallace

1142 Hudson Road
Cambridge, MD 21613 USA

Phone: 410-376-3200 410-749-9226
Fax: 410-376-2135 410-749-9280
e-mail: DHWALLACE@AOL.COM

Hoff, Thomas B.

From: Thomas T. Alspach <talspach@goeaston.net>
Sent: Thursday, May 19, 2011 12:04 PM
To: Hoff, Thomas B.
Subject: Sea Watch 2012-14 Quota Recommendations

Good Afternoon Tom –

You have asked members of the surf clam/quahog Industry Advisory Panel to provide you with their recommendations for surf clam/quahog quota levels, for the forthcoming meeting in June. These will be the "three year" quotas that theoretically will remain in place for the period of 2012 through 2014.

On behalf of Sea Watch International, Ltd., I recommend that the quotas for both species be maintained at their current levels. I make this recommendation for several reasons. First, the Council will be setting quotas based upon precisely the same science as was available one year ago – i.e., the last peer reviewed assessments. Based on those assessments, the Council last year continued the quotas at the current levels and there has been no new science introduced that should alter this result.

I understand that LPUE's have continued to decline but that really is an economic issue for the fishery. Further, one would hardly expect anything but such declines because the fleet continues to harvest the vast majority of the resource from the same several 10 minute squares – i.e., the identical fishing grounds are being hit again and again with the inevitable result that abundance in those specific areas should decline. Second, while LPUE's may indeed have declined over the past 10 years, they really are still generally consistent with what LPUE's were back in the '70's and '80's and therefore current trends are merely consistent with the long run.

On this same point, the abundance of the biomass, while showing a gradual decline in the last decade, still is at levels experienced in the '70's and '80's so that – again – when one views the abundance trends for the entire period of history, there is no significant loss of abundance. This is one reason why the scientists have concluded that our resource is not overfished and overfishing is not occurring. Further, you will recall that the last surf clam assessment concluded that because we are experiencing negative "surplus production," this slight downward trend in abundance is not the result of fishing, and would be evident even if there were no fishing at all.

The only other question raised at the quota setting meeting last year was whether the resource on Georges Bank should be considered as part of the available biomass for quota setting purposes. It was determined that Georges Bank would and should be considered as part of the exploitable biomass if fishing were occurring there. Your office now has substantial documentation of the fact that regular trips to Georges Bank now are occurring, and are permissible pursuant to the federally sanctioned testing protocol. This fishing will continue, and likely will expand when the next amendment to the FMP generally opens that resource, so long as applicable testing protocols are being observed.

Therefore, the "Georges Bank criterion" has been amply satisfied, and that resource should be included as part of the resource that is available for quota setting purposes – which, of course, comports with the legal requirement that the fishery must be managed across its entire range.

Thank you for considering this information. Look forward to seeing you in June.

TTA

Thomas T. Alspach
295 Bay Street, Suite One
P.O. Box 1358
Easton, MD 21601
410-822-9100

Confidentiality Notice

Hoff, Thomas B.

From: George Richardson <grrclam@juno.com>
Sent: Friday, April 29, 2011 12:14 PM
To: Hoff, Thomas B.
Subject: Re: Clam Advisors Advice

I agree with staff - no change.

Hoff, Thomas B.

From: J G LACOTTE <jlacotte@msn.com>
Sent: Tuesday, May 10, 2011 8:08 AM
To: Hoff, Thomas B.
Subject: RE: Clam Advisors Advice

Hello Tom,
Based upon the current scientific information, I agree with Staff that there is no reason to change the quotas for 2012 and 2013.
See you in NY.
Thanks,
Joe

Subject: Clam Advisors Advice
Date: Fri, 29 Apr 2011 11:50:21 -0400
From: thoff@mafmc.org
To: Advisors-Clam@mafmc.org
CC: thoff@mafmc.org; jmontanez@mafmc.org

Good morning everyone. It is that time of year – quota recommendations-time! Jose and I have just started working on the specifications document for the Council and I wanted to solicit industry input from the Advisors on the recommended quotas. Staff, at this very early stage, currently believes there is no reason to change the quotas for 2012 or 2013 that were recommended by the Council last year. Staff is concerned that, as many in industry are also, that the continued LPUE decline is worrisome.

A survey is scheduled for this June and July with a surfclam assessment scheduled for 2012. In 2013 the Council will be recommending quotas for the next multi-year cycle. The assessments from 2009 conclude that neither resource is overfished and overfishing is not occurring.

The Council will be meeting June 14-16 in Port Jefferson NY. We envision a Committee meeting with Advisors early in that meeting. You will certainly be able to comment to the Committee and Council on these quotas, but if you would like to provide your input before that, I welcome your input. Thank you.

Tom

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Senior Ecologist
Mid-Atlantic Fishery Management Council
800 North State St, Suite 201
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Phone: 302-526-5257