Mid-Atlantic Fishery Management Council
Atlantic Surfclam Information Document – April 2017

Note: The Atlantic surfclam stock was assessed and peer reviewed in July 2016. In addition to the stock assessment reports, the Northeast Fishery Science Center (Dan Hennen Pers. Comm., NEFSC 2017) has provided a data update that provides more recent fishery data available. The following summarizes some of the information from the stock assessment and data update, but not all; the full reports can be referenced for additional details and are available at: http://www.mafmc.org/ssc-meetings/2017/may-17-18.

Management System

The Fishery Management Plan (FMP) for Atlantic surfclam (*Spisula solidissima*) became effective in 1977. The FMP established the management unit as all Atlantic surfclams in the Atlantic Exclusive Economic Zone (EEZ). The FMP is managed by the Mid-Atlantic Fishery Management Council (Council), in conjunction with the National Marine Fisheries Service (NMFS) as the Federal implementation and enforcement entity. The primary management tool is the specification of an annual quota, which is allocated to the holders of allocation shares (Individual Transferable Quotas - ITQs) at the beginning of each calendar year as specified in Amendment 8 to the FMP (1988). In addition to the Federal waters fishery, there is a small fishery prosecuted in the state waters of New York, New Jersey, and Massachusetts. The FMP, including subsequent Amendments and Frameworks, is available on the Council website at: http://www.mafmc.org.

Basic Biology

Information on Atlantic surfclam biology can be found in the document titled, "Essential Fish Habitat Source Document: Surfclam, *Spisula solidissima*, Life History and Habitat Requirements" (Cargnelli et al. 1999). An electronic version is available at the following website: http://www.nefsc.noaa.gov/nefsc/habitat/efh. Additional information on this species is available at the following website: http://www.fishwatch.gov. A summary of the basic biology is provided below.

Atlantic surfclams are distributed along the western North Atlantic Ocean from the southern Gulf of St. Lawrence to Cape Hatteras. Surfclams occur in both the state territorial waters (≤ 3 mi from shore) and within the EEZ (3-200 miles from shore). Commercial concentrations are found primarily off New Jersey, the Delmarva Peninsula, and on Georges Bank. In the Mid-Atlantic region, surfclams are found from the intertidal zone to a depth of about 60 meters (197 ft), but densities are low at depths greater than 40 meters (131 ft).

The maximum size of surfclams is about 22.5 cm (8.9 inches) shell length, but surfclams larger than 20 cm (7.9 inches) are rare. The maximum age exceeds 30 years and surfclams of 15-20 years of age are common in many areas. Surfclams are capable of reproduction in their first year of life, although full maturity may not be reached until the second year. Eggs and sperm are shed directly into the water column. Recruitment to the bottom occurs after a planktonic larval period of about three weeks.

Atlantic surfclams are suspension feeders on phytoplankton, and use siphons which are extended above the surface of the substrate to pump in water. Predators of surfclams include certain species of crabs, sea stars, snails, and other crustaceans, as well as fish predators such cod and haddock.

Status of the Stock

The Atlantic surfclam stock assessment was peer reviewed and approved for use by management at Stock Assessment Workshop 61 (SAW 61; July 2016). A statistical catch at age and length model called Stock Synthesis was used. Reports on "Stock Status," including assessment and reference point updates, SAW reports, and Stock Assessment Review Committee (SARC) panelist reports are available online at the NEFSC website: http://www.nefsc.noaa.gov/saw.

New reference points were developed for SAW 61 which are more justified scientifically. The new biomass reference points and measures of stock biomass are ratios rather than absolute biomass in weight. This approach allows for conclusions about the status of the surfclam stock despite substantial uncertainty in the actual biomass of the stock.

The Atlantic surfclam stock was not overfished in 2015 (Figure 1; NEFSC 2016). Based on recommended reference points for the whole stock which use spawning stock biomass (SSB), estimated $SSB_{2015}/SSB_{Threshold} = 2.54$ (probability overfished < 0.01). For surfclam, SSB is almost equal to total biomass. Trends expressed as the ratio $SSB/SSB_{Threshold}$ are more reliably estimated than SSB. For the whole stock, relative SSB ($SSB/SSB_{Threshold}$) declined during the last fifteen years but is still above the target.

Overfishing did not occur in 2015 (Figure 2; NEFSC 2016). Based on new recommended reference points, estimated $F_{2015}/F_{Threshold} = 0.295$ (probability overfished < 0.01). Trends expressed as the ratio $F/F_{Threshold}$ are more reliably estimated than absolute fishing mortality rates. For the whole stock the trend in relative F ($F/F_{Threshold}$) generally increased during the last fifteen years (despite recent declines in the south) but is still below the threshold.

Trends expressed as the ratio of recruitment (R) and mean recruitment in an unfished stock (R_0) are more reliably estimated than absolute recruitment (Figure 3; NEFSC 2016). The trend in relative recruitment is measured using the ratio R/R_0. Recruitment generally increased over the last decade, and in 2015 R/R_0 was 0.57 in the north, 0.97 in the south, and 0.75 for the stock as a whole, indicating recruitment in 2015 was about 57%, 97% and 75% of the maximum long term average in the three regions. These recruitment patterns are probably normal in a surfclam stock at relatively high biomass and with low fishing mortality. Recruitment for the whole stock is measured as the geometric mean of R/R_0 in the northern and southern areas and is more uncertain than estimates for either area.

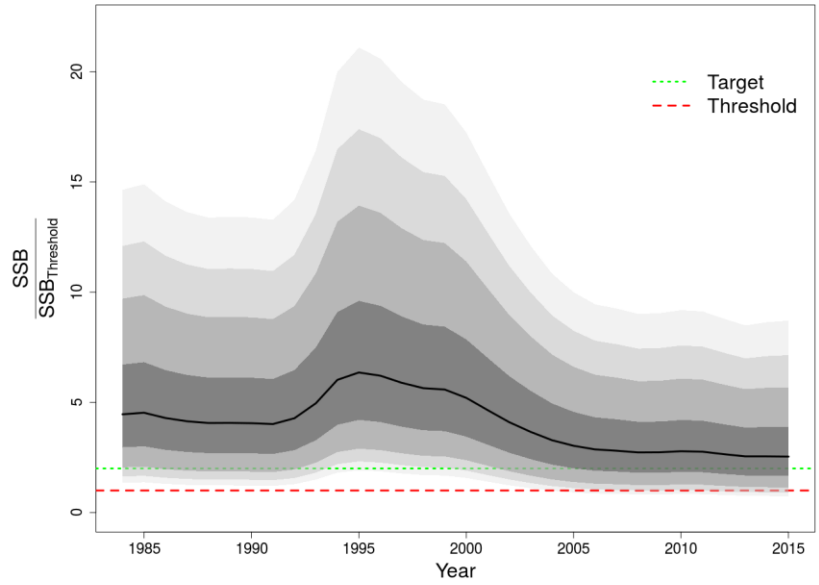

Figure 1. Trends in relative spawning stock biomass ($SSB/SSB_{Threshold}$) for the whole Atlantic surfclam stock during 1984-2015 (NEFSC 2016). The solid line shows estimates from this assessment with approximate 50, 80, 90, and 95th percentile lognormal confidence intervals in shades of grey. The green short-dash line at $SSB/SSB_{Threshold} = 2$ is the management target. The red long-dash line at $SSB/SSB_{Threshold} = 1$ is the level that defines an overfished stock.

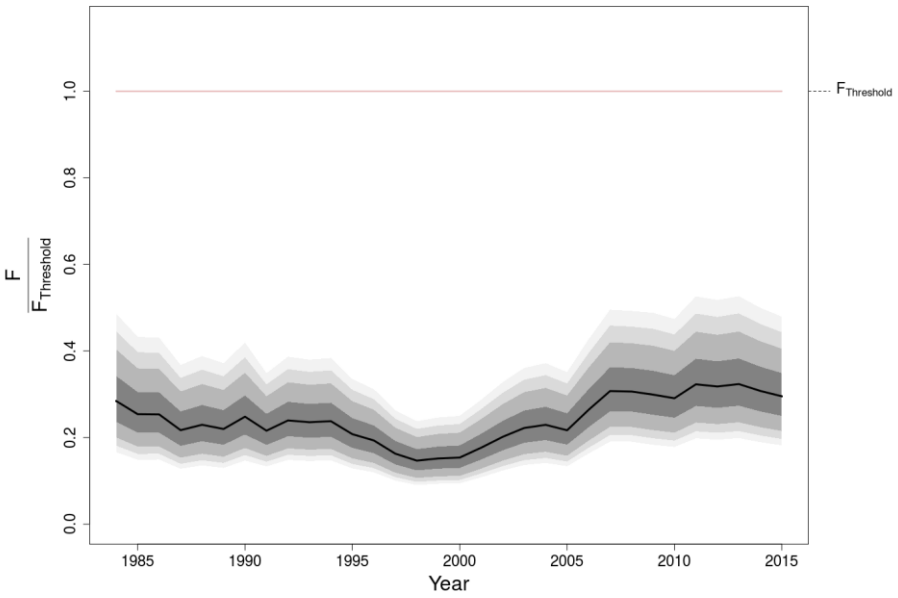

Figure 2. Trends in relative fishing mortality $F/F_{Threshold}$ for the whole Atlantic surfclam stock 1984-2015 (NEFSC 2016). The solid line shows estimates from this assessment with approximate 50, 80, 90, and 95th percentile lognormal confidence intervals in shades of grey. The solid line at $F/F_{Threshold} = 1$ is the new fishing mortality threshold reference point.

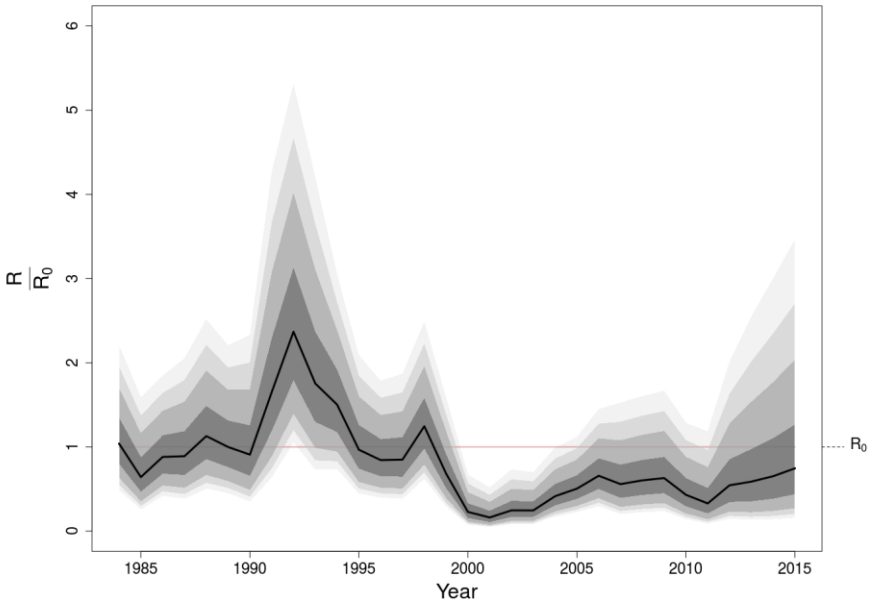

Figure 3. Trends in relative recruitment (R/R_0 for age zero recruits) for the whole Atlantic surfclam stock during 1984-2015 (NEFSC 2016). The solid line shows estimates from this assessment with approximate 50, 80, 90, and 95th percentile lognormal confidence intervals in shades of grey. The horizontal line is mean recruitment in an unfished stock.

Description of the Fishery and Market

The commercial fishery for surfclam in Federal waters is prosecuted with large vessels and hydraulic dredges. Surfclam landings and commercial quotas are given in Table 1 and Figure 4. The distribution of the fishery has changed over time, as shown in Figures 5-9, with a shift to increased landings in Southern New England and Georges Bank areas.

Figures 10-12 provide the distribution of surfclam landings, fishing effort, and landings per unit effort (LPUE) in "important" ten minute squares (TMSQ). Important means that a square ranked in the top 10 TMSQ for total landings during any five-year period (1980-1984, 1985-1989, 1990-1994, 1995-1999, 2000-2004, 2005-2009, 2010-2016). Data for 2016 are incomplete and preliminary, and is included in the last time block.

Additional information of the length composition of port sampled surfclams, and their associated sample sizes by area, are available in the stock assessment reports and data update (Dan Hennen Pers. Comm., NEFSC 2017) at: http://www.mafmc.org/ssc-meetings/2017/may-17-18.

Table 1. Federal surfclam quotas and landings: 1998-2018. Landings for state waters are approximated as total landings - EEZ landings and may not accurately reflect state landings.

Year	Total Landings (mt meats; includes state waters)	EEZ Landings (mt meats)	EEZ Landings[a] ('000 bu)	EEZ Quota ('000 bu)	% Harvested
1998	24,506	18,234	2,365	2,565	92%
1999	26,677	19,577	2,539	2,565	99%
2000	31,093	19,788	2,566	2,565	100%
2001	31,237	22,017	2,855	2,850	100%
2002	32,645	24,006	3,113	3,135	99%
2003	31,526	24,994	3,241	3,250	100%
2004	26,463	24,197	3,138	3,400	92%
2005	22,734	21,163	2,744	3,400	81%
2006	25,779	23,573	3,057	3,400	90%
2007	27,091	24,915	3,231	3,400	95%
2008	25,038	22,510	2,919	3,400	86%
2009	22,396	20,065	2,602	3,400	77%
2010	19,941	17,984	2,332	3,400	69%
2011[b]	20,044	18,839	2,443	3,400	72%
2012[b]	18,393	18,054	2,341	3,400	69%
2013[b]	18,924	18,551	2,406	3,400	71%
2014[c]	18,834	18,227	2,364	3,400	70%
2015[c]	18,478	18,154	2,354	3,400	69%
2016[c]	14,123[e]	17,885[e]	2,319[e]	3,400	68%[e]
2017[d]	NA	NA	NA	3,400	NA
2018[d]	NA	NA	NA	3,400	NA

[a] 1 surfclam bushel is approximately 17 lb. [b] The Scientific and Statistical Committee (SSC) recommended an overfishing limit (OFL) for 2010, 2011, 2012, and 2013 of 129,300 mt, 114,00 mt, 102,300 mt, and 93,400 mt, respectively, and an acceptable biological catch (ABC) of 96,600 mt (2011-2013). [c] For 2014-2016, the SSC recommended an OFL of 81,150 mt, 75,178 mt, 71,512 mt, respectively, and an acceptable biological catch (ABC) of 60,313 mt, 51,804 mt, and 48,197 mt, respectively. [d] For 2017-2018, the SSC recommended an OFL of 69,925 mt and 70,102 mt, respectively, and an acceptable biological catch (ABC) of 44,469 mt and 45,524 mt, respectively. [e] Preliminary, incomplete 2016 data. Source: NMFS clam vessel logbook reports. Dan Hennen Pers. Comm., NEFSC 2017.

Port and Community Description

When Amendment 13 to the FMP was developed, the Council hired Dr. Bonnie McCay and her associates at Rutgers University to describe the ports and communities that are associated with the surfclam and ocean quahog fisheries. The researchers did an extensive job characterizing the three main fisheries (non-Maine ocean quahog, Maine ocean quahog, and surfclam). The McCay team characterizations of the ports and communities are based on government census and labor statistics and on observations and interviews carried out during the late 1990s and in the fall of 2001. The description of the fishing gear, areas fished, etc. are fully described in Amendment 13. Communities from Maine to Virginia are involved in the harvesting and processing of surfclams and ocean quahogs. Ports in New Jersey and Massachusetts handle the most volume and value, particularly Atlantic City and Point Pleasant, New Jersey, and New Bedford, Massachusetts. There are also landings in Ocean City, Maryland, and the Jonesport and Beals Island areas of Maine.

Additional information on "Community Profiles for the Northeast US Fisheries" can be found at: http://www.nefsc.noaa.gov/read/socialsci/communityProfiles.html.

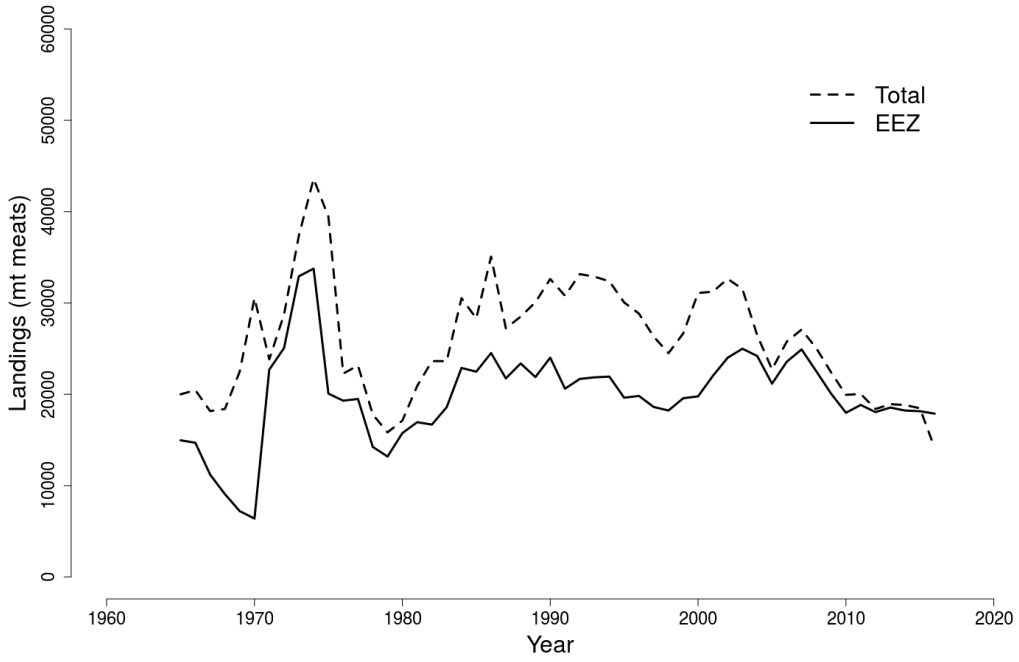

Figure 4. Surfclam landings (total and EEZ) during 1965-2015, and preliminary 2016. Source: Dan Hennen Pers. Comm., NEFSC 2017.

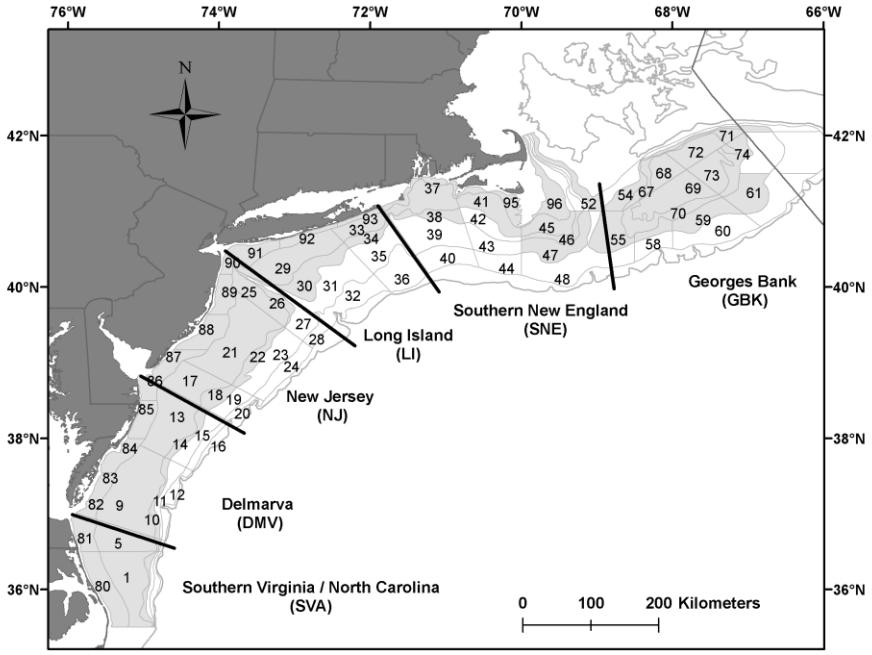

Figure 5. Surfclam stock assessment regions and NEFSC shellfish survey strata. The shaded strata are where surfclams are found. Source: Dan Hennen Pers. Comm., NEFSC 2017.

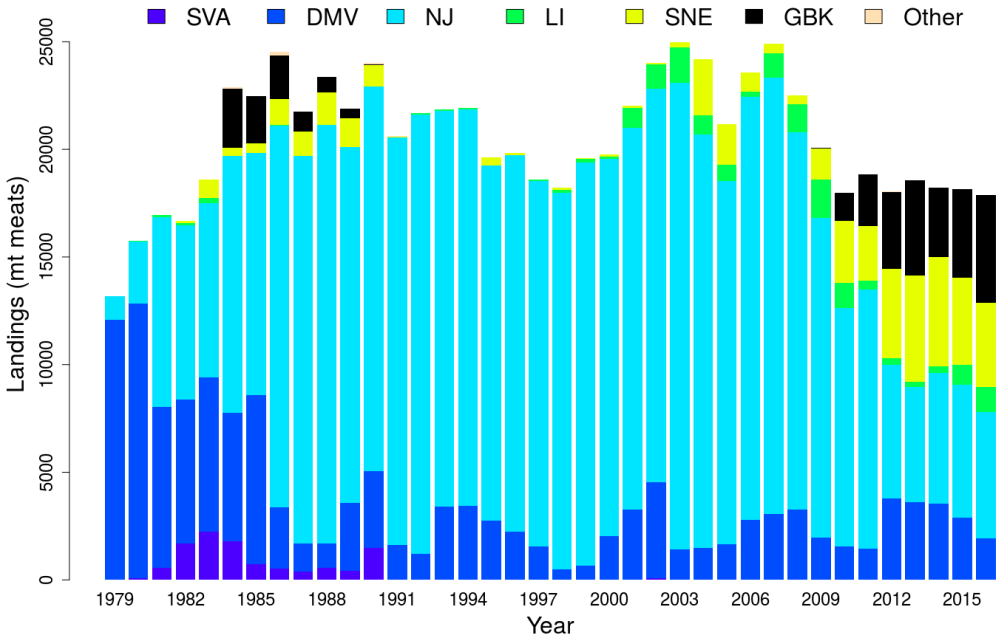

Figure 6. Surfclam landings from the US EEZ during 1979-2015, and preliminary 2016, by stock assessment region. Source: Dan Hennen Pers. Comm., NEFSC 2017.

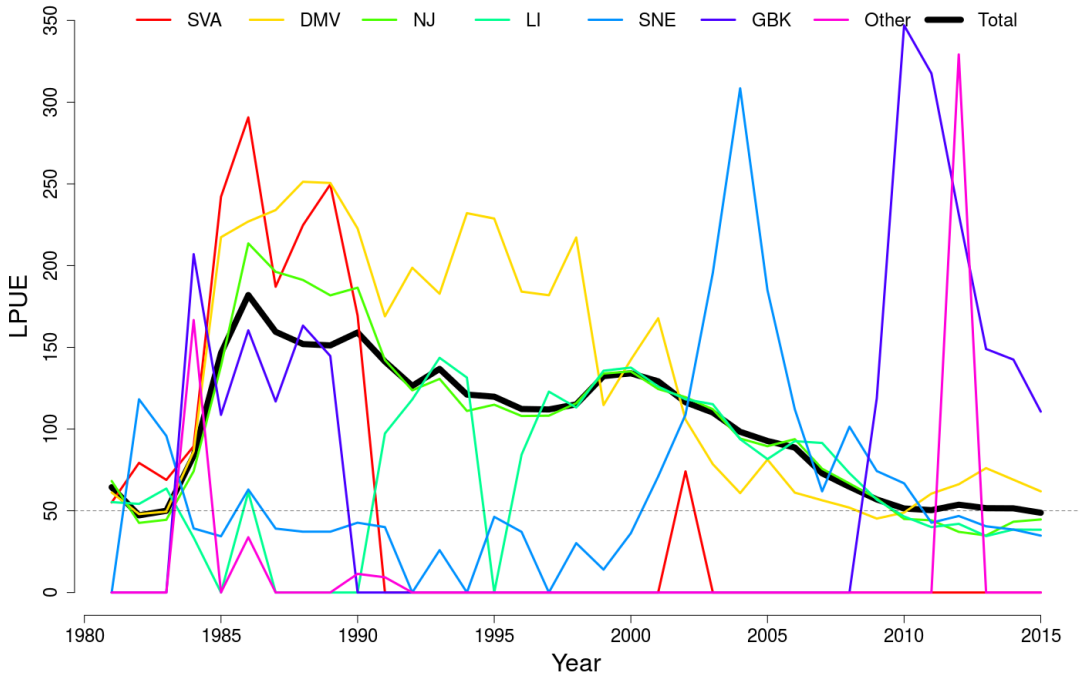

Figure 7. Nominal landings per unit effort (LPUE in bushels landed per hour fished) for surfclam, by region, during 1981-2015, and preliminary 2016. LPUE is total landings in bushels divided by total fishing effort. Source: Dan Hennen Pers. Comm., NEFSC 2017.

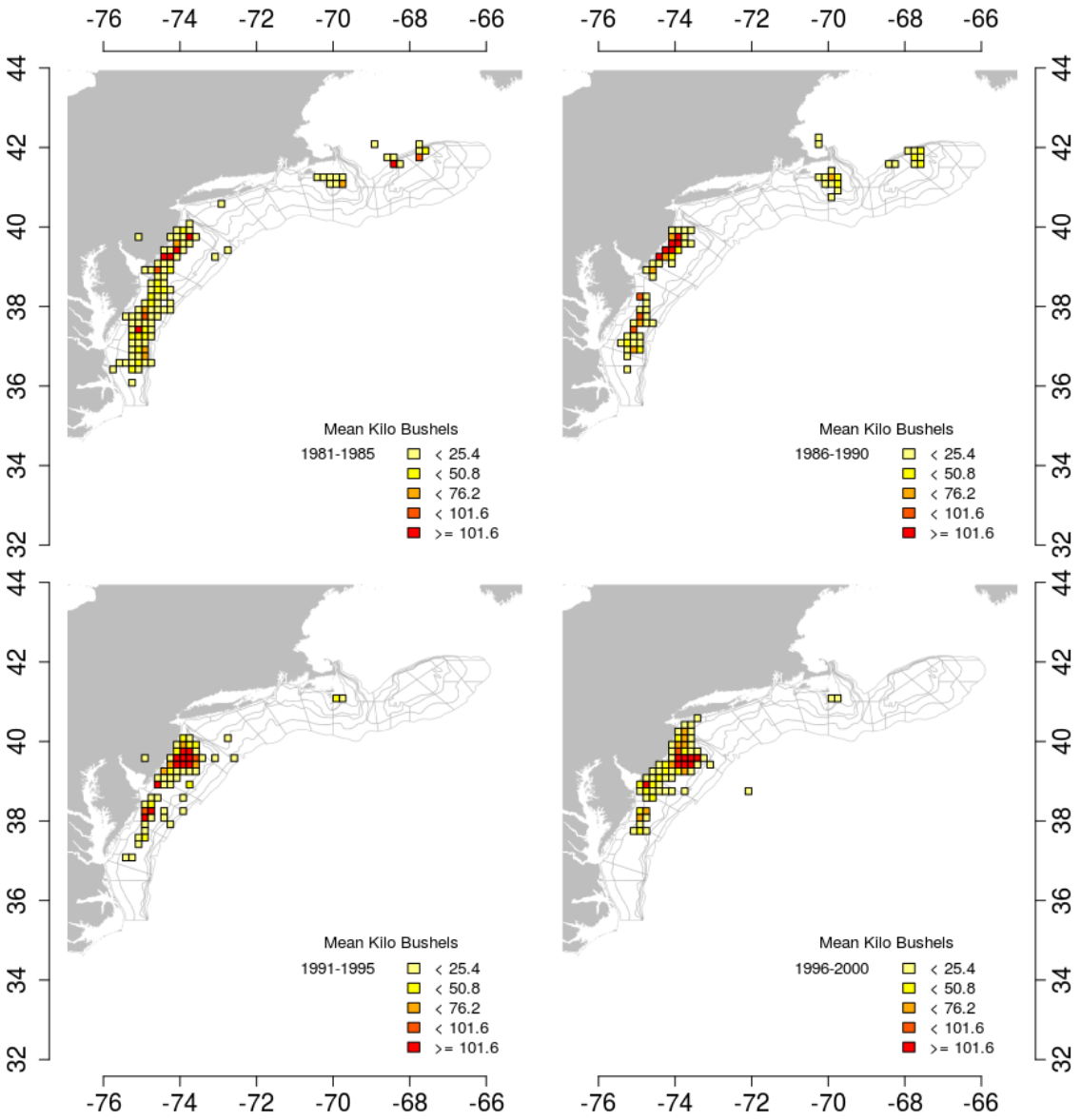

Figure 8. Average surfclam landings by ten-minute squares over time, 1981-2000. Only squares where more the 5 kilo bushels were caught are shown. Source: Dan Hennen Pers. Comm., NEFSC 2017.

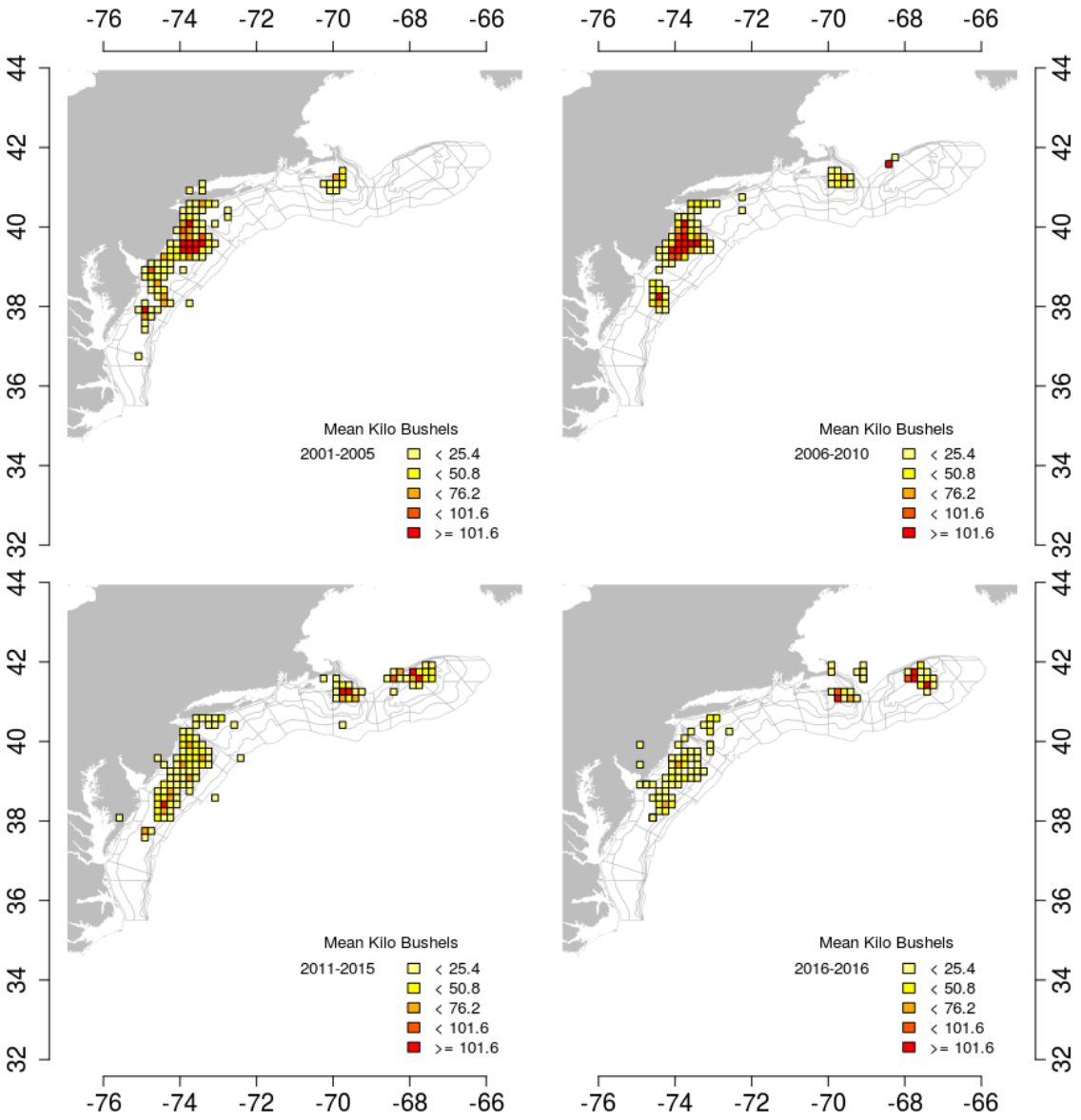

Figure 9. Average surfclam landings by ten-minute squares over time, 2001-2015, and preliminary 2016. Only squares where more the 5 kilo bushels were caught are shown. Source: Dan Hennen Pers. Comm., NEFSC 2017.

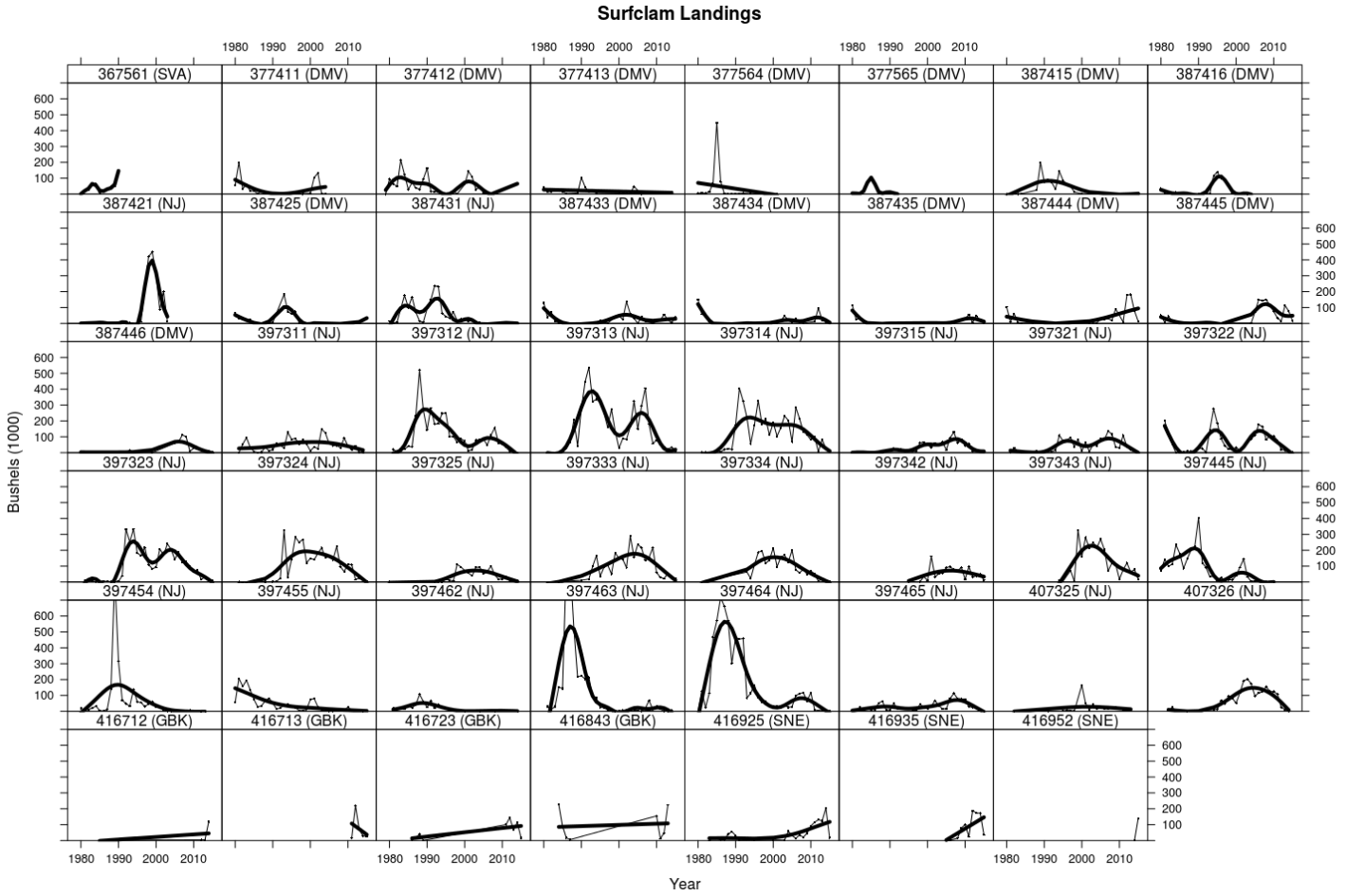

Figure 10. Annual surfclam landings in "important" ten minute squares (TNMS) during 1980-2016 based on logbook data. Important means that a square ranked in the top 10 TNMS for total landings during any five-year period (1980-1984, 1985-1989, ..., 2000-2004, 2005-2009, 2010-2016). Data for 2016 are incomplete and preliminary. To protect the privacy of individual firms, data are not plotted if the number of vessels is less than 2. Instead, a "^" is shown on the x-axis to indicate where data are missing. The solid dark line is a spline intended to show trends. The spline was fit too all available data, including data not plotted. Source: Dan Hennen Pers. Comm., NEFSC 2017.

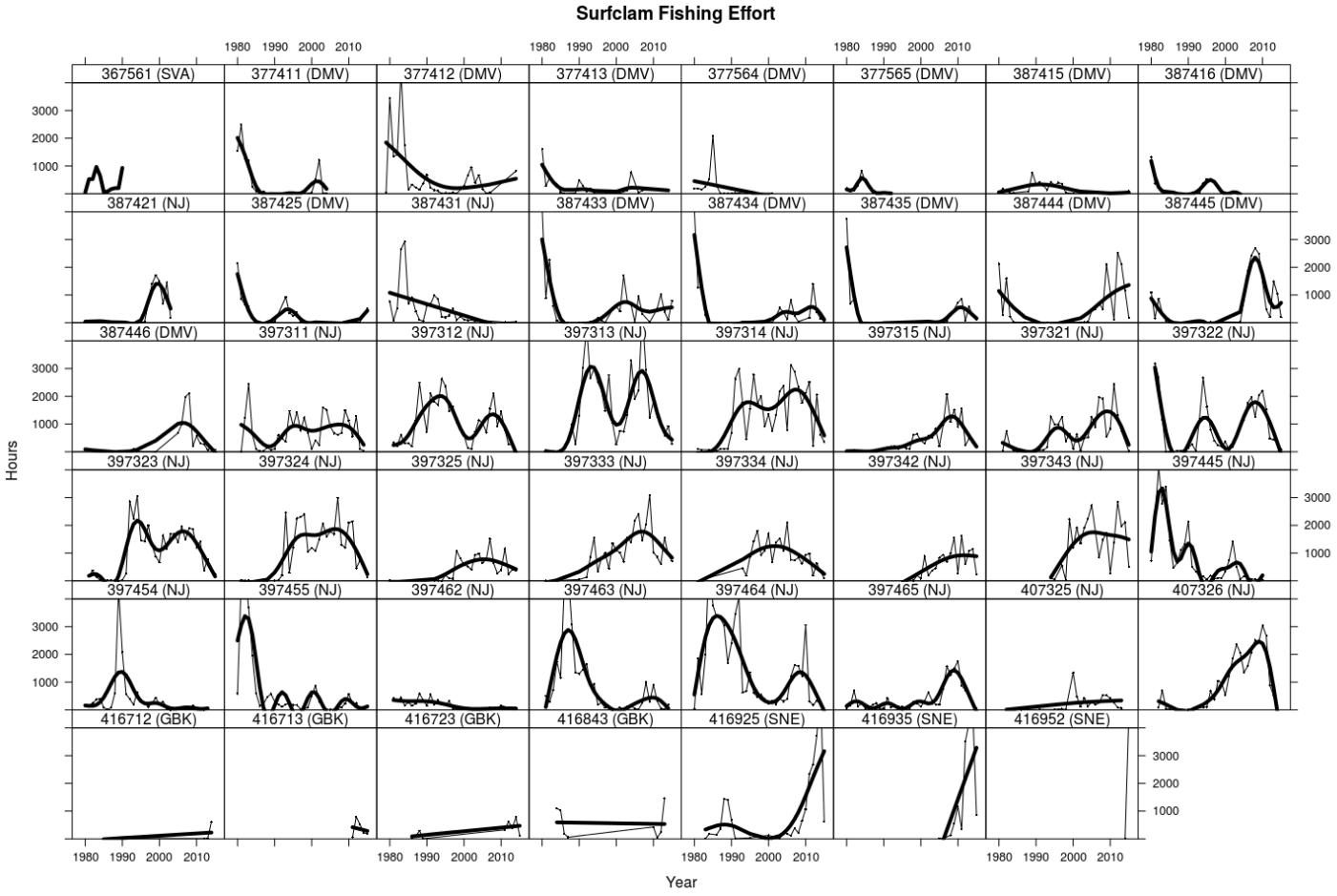

Figure 11. Annual surfclam effort (hours y^{-1}) in "important" ten minute squares (TNMS) during 1980-2016 based on logbook data. Important means that a square ranked in the top 10 TNMS for total landings during any five-year period (1980-1984, 1985-1989, ..., 2000-2004, 2005-2009, 2010- 2016). Data for 2016 are incomplete and preliminary. To protect the privacy of individual firms, data are not plotted if the number of vessels is less than 2. Instead, a "^" is shown on the x-axis to indicate where data are missing. The solid dark line is a spline intended to show trends. The spline was fit too all available data, including data not plotted. Source: Dan Hennen Pers. Comm., NEFSC 2017.

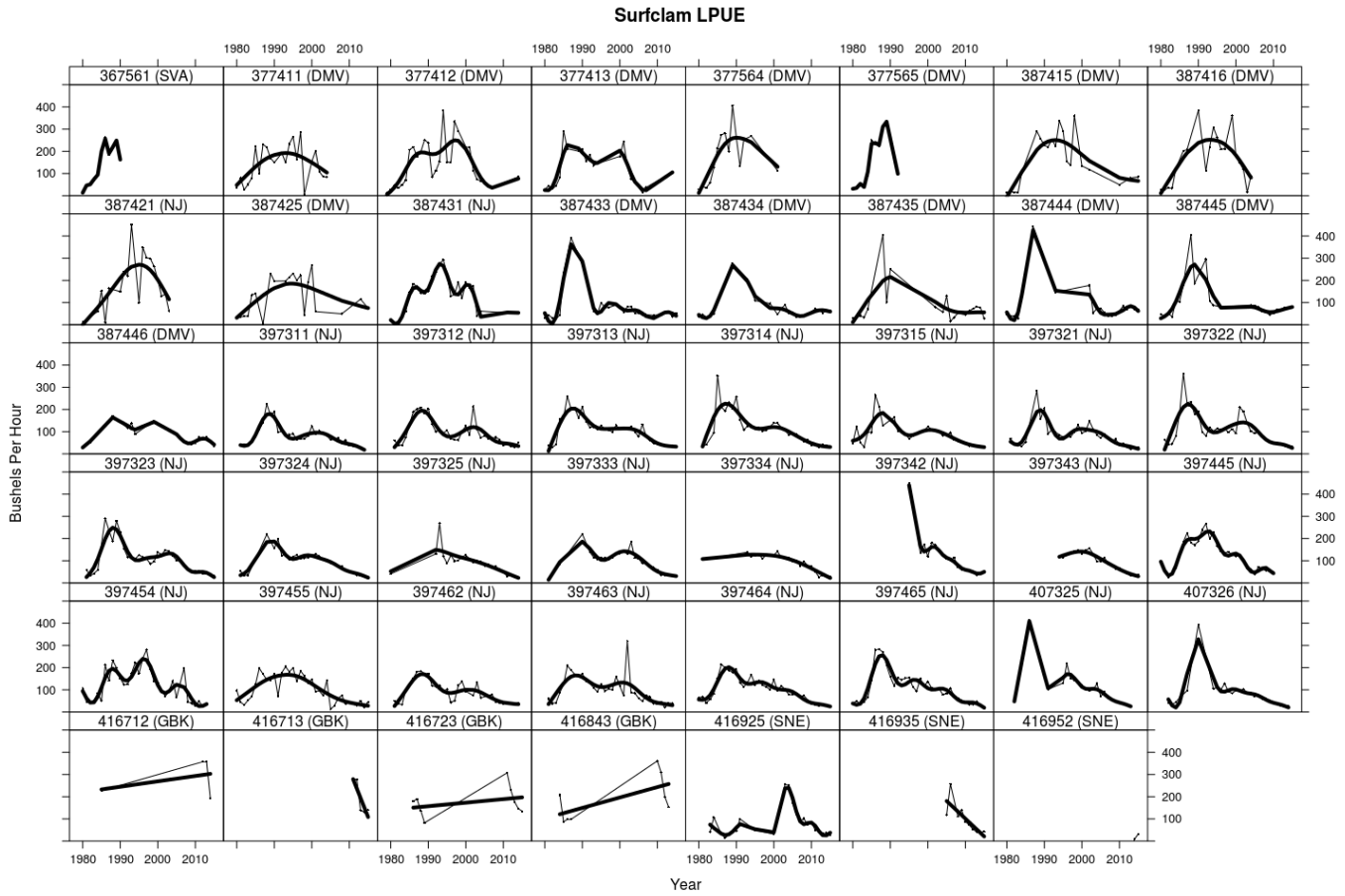

Figure 12. Annual surfclam LPUE (bu h^{-1}) in "important" ten minute squares (TNMS) during 1980-2016 based on logbook data. Important means that a square ranked in the top 10 TNMS for total landings during any five-year period (1980-1984, 1985-1989, ..., 2000-2004, 2005-2009, 2010- 2016). Data for 2016 are incomplete and preliminary. To protect the privacy of individual firms, data are not plotted if the number of vessels is less than 2. Instead, a "^" is shown on the x-axis to indicate where data are missing. The solid dark line is a spline intended to show trends. The spline was fit too all available data, including data not plotted. Source: Dan Hennen Pers. Comm., NEFSC 2017.

Federal Fleet Profile

The total number of vessels participating in the surfclam fishery has remained relatively stable from 2007 through 2016, and has ranged from 32 vessels in 2008 to 42 vessels in 2012 (Table 2). The average ex-vessel price of surflcams reported by processors was $13.25 in 2016, slightly higher than the $12.61 per bushel seen in 2015. The total ex-vessel value of the 2016 federal harvest was approximately $31 million, slightly higher than $30 million in 2015. Industry has described several factors that have affected their industry. 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 has increased due to the rising costs of insurance; industry has also indicated price of diesel fuel in conjunction with distance traveled to fish is a big factor determining trip cost. Trips harvesting surfclams have increased in length as catch rates have declined. The distribution of LPUE in bushels per hour over time is shown in Figures 7 and 12-14.

Processing Sector

Even though this document describes the surfclam fishery, the information presented in this section regarding the processing sector is for both surfclams and ocean quahogs as some of these facilities purchase/process both species. In 2016, there were 9 companies reporting purchases of surfclams and/or ocean quahogs from the industrial fisheries outside of Maine. They were distributed by state as indicated in Table 3. Employment data for these specific firms are not available. In 2016, these companies bought approximately $31 million worth of surfclam and $22 million worth of ocean quahogs.

Area Closures

Areas can be closed to surfclam fishing if the abundance of small clams in an area meets certain threshold criteria. This small surfclam closure provision was applied during the 1980's with three area closures (off Atlantic City, NJ, Ocean City, MD, and Chincoteague, VA), with the last of the three areas reopening in 1991. Industry has indicated that in 2015 they implemented two large, voluntary closures off Ocean City, MD and Point Pleasant, NJ (250 square miles) to protect small surfclams and to maximize their use of the resource. Details on the location of these closures have not been provided by industry and are unknown.

Fishing areas can also be closed for public health related issues due to environmental degradation or the toxins that cause parayltic shellfish poisoning (PSP). PSP is a public health concern for surfclams. PSP is caused by saxitoxins, produced by the alga *Alexandrium fundyense* (red tide). Surfclams on Georges Bank were not fished from 1990 to 2008 due to the risk of PSP. There was light fishing on Georges Bank in years 2009-2011 under an exempted fishing permit and LPUE in that area was substantially higher (5-7 times higher) than in other traditional fishing grounds. The Greater Atlantic Regional Fisheries Office reopened a portion of Georges Bank to the harvest of surfclam and ocean quahogs beginning January 1, 2013 (77 FR 75057, December 19, 2012) under its authority in 50 CFR 648.76. Harvesting vessels must adhere to the adopted testing protocol from the National Shellfish Sanitation Program.

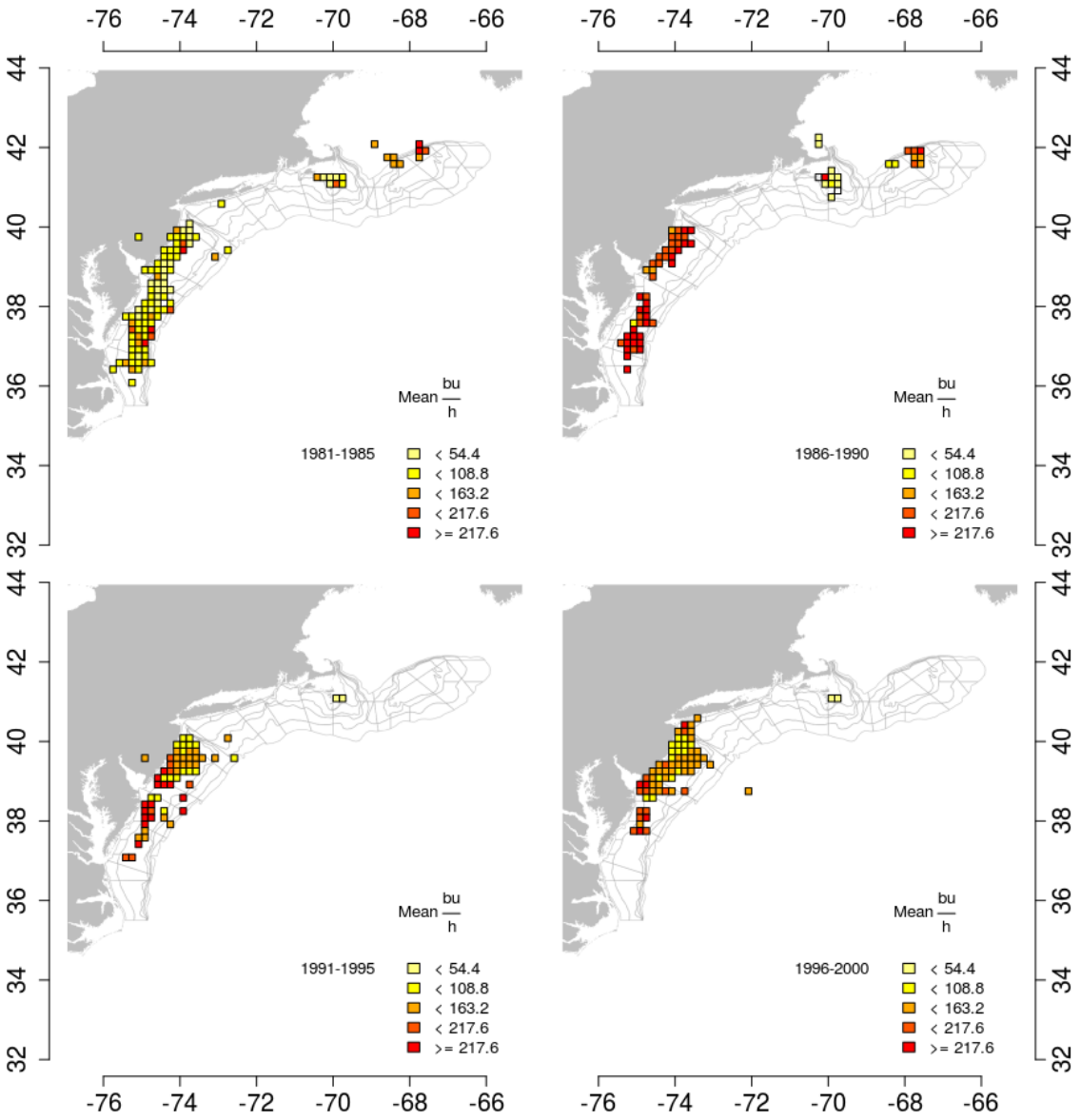

Figure 13. Average surfclam landings per unit effort (LPUE; bu. h^{-1}) by ten-minute squares over time, 1981-2000. Only squares where more the 5 kilo bushels were caught are shown. Source: Dan Hennen Pers. Comm., NEFSC 2017.

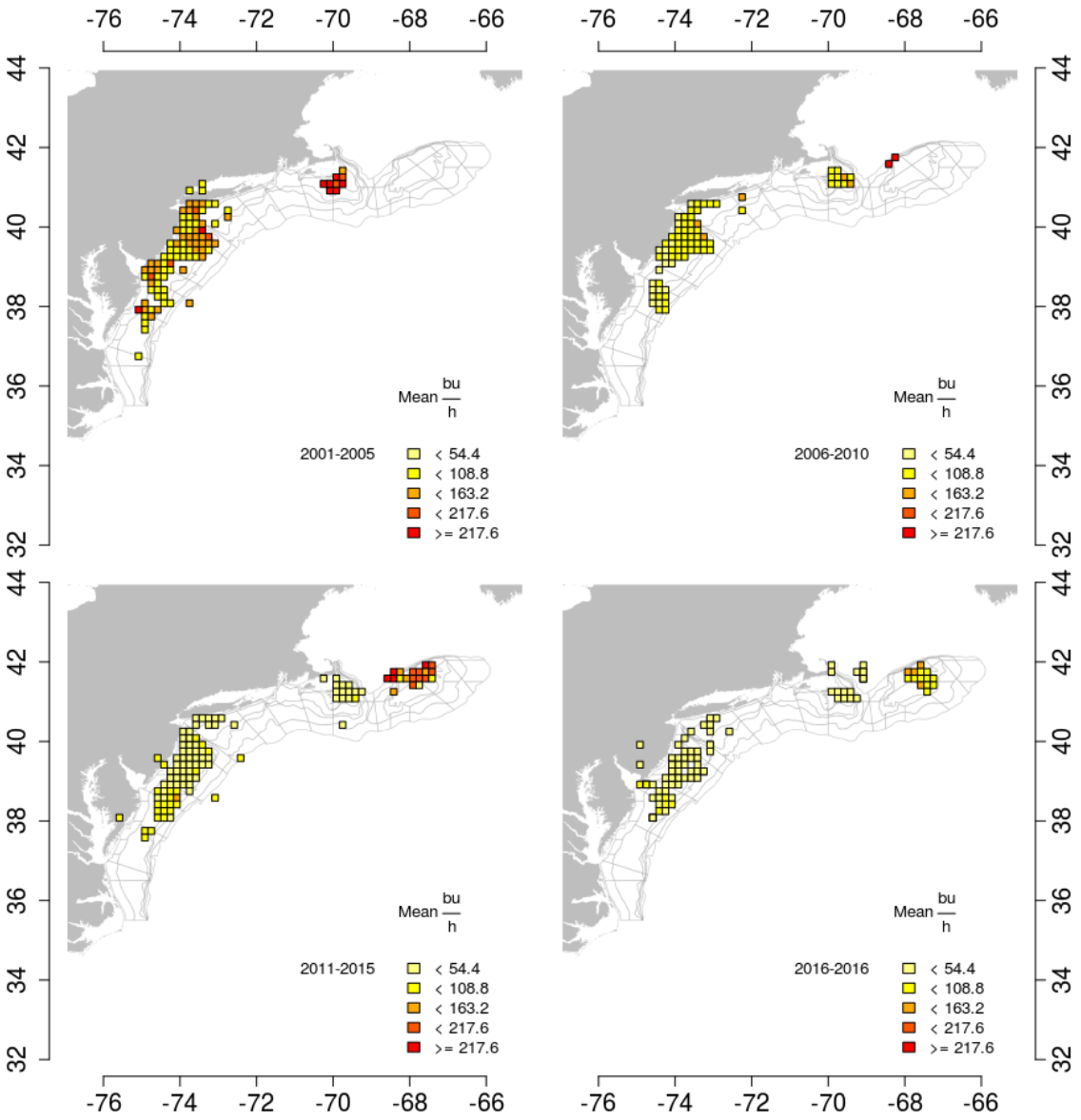

Figure 14. Average surfclam landings per unit effort (LPUE; bu. h-1) by ten-minute squares over time, 2001-2015 and preliminary 2016. Only squares where more the 5 kilo bushels were caught are shown. Source: Dan Hennen Pers. Comm., NEFSC 2017.

Table 2. Federal fleet profile, 2007 through 2016.

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Harvesting BOTH surfclams & ocean quahogs	9	8	8	12	12	13	7	7	6	8
Harvesting only surfclams	24	24	28	22	24	29	33	31	31	30
Total Vessels	33	32	36	34	36	42	40	38	37	38

Source: NMFS clam vessel logbooks.

Table 3. Companies that reported buying surfclams and ocean quahogs (from NMFS surfclam/ocean quahog dealer report database) in 2016.

Number of Companies	MA	Other
	7	2

References

Cargnelli, L., S. Griesbach, D. Packer, and E. Weissberger. 1999. Essential Fish Habitat Source Document: Atlantic Surfclam, *Spisula solidissima*, Life History and Habitat Characteristics. NOAA Tech. Memo. NMFS-NE-142.

Hennen, Dan. Personal Communication. March 15, 2017. NOAA Fisheries, Northeast Fisheries Science Center, 166 Water St., Woods Hole, MA 02543.

Northeast Fisheries Science Center. 2016. 61st Northeast Regional Stock Assessment Workshop (61st SAW) Assessment Summary Report. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 16-13; 26 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026, or online at http://www.nefsc.noaa.gov/publications.