



**Mid-Atlantic Fishery Management Council**  
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## MEMORANDUM

**DATE:** July 3, 2018

**TO:** Chris Moore, Executive Director

**FROM:** Julia Beaty, Staff

**SUBJECT:** 2019 Scup Management Measures and Review of Scup Discards through 2017

### Executive Summary

In 2017, the Mid-Atlantic Fishery Management Council (Council) and the Atlantic States Marine Fisheries Commission's (Commission's) Summer Flounder, Scup, and Black Sea Bass Management Board (Board) revised the scup catch and landings limits for 2018 and set catch and landings limits for 2019. The Council's Scientific and Statistical Committee (SSC) and Monitoring Committee, as well as the Council and Board, will review the 2019 catch and landings limits in July and August 2018.

Council staff recommend no changes to the previously implemented 2019 catch and landings limits, including the 2019 acceptable biological catch (ABC) of 36.43 million pounds (16,525 mt), the commercial annual catch limit (ACL) and annual catch target (ACT) of 28.42 million pounds (12,890 mt), commercial quota of 23.98 million pounds (10,879 mt), recreational ACL and ACT of 8.01 million pounds (3,636 mt), and recreational harvest limit (RHL) of 7.37 million pounds (3,342 mt). The process used to derive these values is described in later sections of this document. In addition, staff recommend no changes to the commercial scup management measures at this time.

According to the 2018 data update from the Northeast Fisheries Science Center (NEFSC) and recreational harvest estimates from the Marine Recreational Information Program (MRIP), the 2017 commercial ACL was exceeded by 17% and the recreational ACL was exceeded by 1%. The ABC was exceeded by about 13%. Neither the commercial quota nor the RHL were exceeded in 2017. According to NEFSC estimates, commercial discards in 2017 were 10.47 million pounds (4,727 mt), the highest since 1981 and a 71% increase from 2016 (NEFSC 2018). This increase in discards was likely mainly due to the large 2015 year class, which is the largest year class since at least 1984. In 2017, these scup were very abundant, but mostly too small to be landed in the commercial fishery due to the commercial minimum fish size of 9 inches total length (Dr. Mark Terceiro, NEFSC, personal communication). An analysis of commercial scup discards through 2017 is included in an appendix to this document. Recreational discards increased by 14% between 2016 and 2017 (from 780,436 pounds/354 mt to 897,281 pounds/407 mt; NEFSC 2018).

Current regulations require pound for pound paybacks of commercial ACL overages. The National Marine Fisheries Service (NMFS) will publish any changes to the 2019 commercial ACL due to the 2017 ACL overage through a notice in the Federal Register. The Council approved a modification to the commercial summer flounder, scup, and black sea bass accountability measures (AMs) in February 2018. This change, which has not yet been implemented, would eliminate the requirement for pound for

pound paybacks of ACL overages when the stock is above the target biomass, as scup is currently.<sup>1</sup> If NMFS approves and implements this change, then the 2017 ACL overage may not require a modification to the 2019 commercial ACL.

Recreational ACL overages do not require pound for pound paybacks when the stock is above the target biomass; therefore, no recreational ACL adjustment is needed in 2019 as a result of the 2017 recreational ACL overage.

Based on the 2017 stock assessment update, the scup stock was not overfished and overfishing was not occurring in 2016. Spawning stock biomass (SSB) was estimated to be about 397 million pounds (179,898 mt) in 2016, about 2.1 times the SSB<sub>MSY</sub> proxy reference point (i.e. SSB<sub>40%</sub>) of 192 million pounds (87,302 mt). Fishing mortality on fully selected age 3 scup was 0.139 in 2016, about 63% of the F<sub>MSY</sub> proxy reference point (F<sub>40%</sub>) of 0.220. At 252 million fish, the 2015 year class was estimated to be the largest in the time series (i.e. 1984-2016) and about 2.1 times the average recruitment (i.e. 65 million age 0 scup). The 2016 year class was estimated to be about 46% below average (NEFSC 2017).

According to the 2018 data update from the NEFSC (NEFSC 2018), the NEFSC bottom trawl survey biomass indices for scup in fall 2015 and spring 2016 were record highs for the time series (i.e. 1963 - present for the fall survey and 1968 through the present for the spring survey). Both seasonal indices decreased after 2016. Several state fisheries-independent surveys show similar trends.

**Table 1:** Scup catch and landings limits for 2019.

Measure	mil lb	mt	Basis
<b>Overfishing Limit (OFL)</b>	41.03	18,612	2017 stock assessment update projections
<b>ABC</b>	36.43	16,525	Assessment projections & risk policy
<b>ABC discards</b>	5.08	2,304	14% of ABC, based on the avg. % of catch that was discarded, 2014-2016
<b>Projected commercial discards</b>	4.43	2,011	87.3% of ABC discards (avg. % of dead discards from commercial fishery, 2014-2016)
<b>Projected recreational discards</b>	0.65	293	12.7% of the ABC discards (avg. % of dead discards from rec. fishery, 2014-2016)
<b>Commercial ACL</b>	28.42	12,890	78% of ABC (per FMP)
<b>Commercial ACT</b>	28.42	12,890	Set equal to commercial ACL
<b>Commercial quota</b>	23.98	10,879	Commercial ACT minus projected commercial discards
<b>Recreational ACL</b>	8.01	3,636	22% of ABC (per FMP)
<b>Recreational ACT</b>	8.01	3,636	Set equal to recreational ACL
<b>RHL</b>	7.37	3,342	Recreational ACT minus projected recreational discards

## **Introduction**

The Magnuson-Stevens Act (MSA) requires that the Council’s SSC provide scientific advice for fishery management decisions, including recommendations on ABCs, prevention of overfishing, and achieving

<sup>1</sup> The proposed change would not modify the existing pound for pound payback requirements for quota overages. The proposed change only addresses overages due to higher than projected discards (i.e. non-landings overages). More information is available here: <http://www.mafmc.org/actions/sfsbsb-commercial-am-framework>.

maximum sustainable yield (MSY). The SSC must recommend ABCs that address scientific uncertainty. The Council's catch limit recommendations cannot exceed the ABCs recommended by the SSC.

The Monitoring Committee develops recommendations for management measures to achieve the ABCs recommended by the SSC. Specifically, the Monitoring Committee recommends ACTs that are equal to or less than the ACLs to address management uncertainty, and recommends management measures designed to achieve the ACTs.

Summer flounder, scup, and black sea bass are cooperatively managed by the Council and the Commission under a joint Fishery Management Plan (FMP). The Council and the Commission's Summer Flounder, Scup, and Black Sea Bass Management Board meet jointly each year to consider SSC and Monitoring Committee recommendations before deciding on proposed scup catch limits and other management measures. The Council and Board may set specifications for scup for up to three years at a time. The Council and Board submit their recommendations to NMFS, which is responsible for implementation and enforcement of federal fisheries regulations.

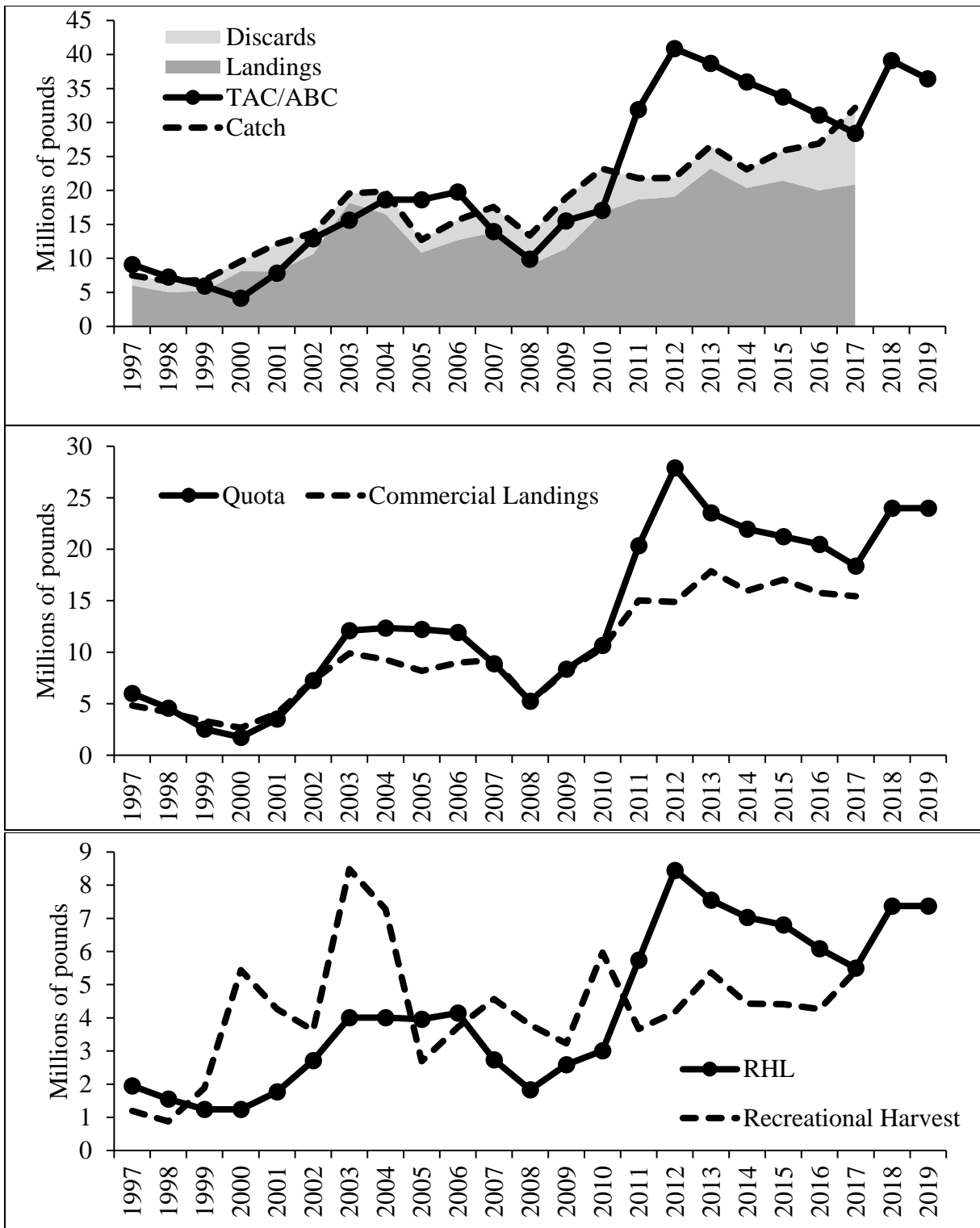
This memorandum includes information to assist the SSC and Monitoring Committee in reviewing and possibly revising the previously implemented 2019 scup catch and landings limits, as well as commercial management measures for 2019. Additional information on fishery performance and past management measures can be found in the 2018 Scup Fishery Information Document (MAFMC 2018A) and the 2017 Summer Flounder, Scup, and Black Sea Bass Fishery Performance Report developed by the Council and Commission Advisory Panels (MAFMC 2018B).

### **Recent Catch and Landings**

According to the 2018 data update from the NEFSC (NEFSC 2018), commercial fishermen landed 15.45 million pounds (7,007 mt) of scup, about 84% of the 2017 commercial quota (18.38 million pounds, 8,337 mt), and discarded 10.42 million pounds of scup (4,727 mt). Commercial catch exceeded the ACL of 22.15 million pounds (12,890 mt) by about 17%.

According to MRIP data, 5.43 million pounds (2,462 mt) of scup were harvested by recreational fishermen from Maine through North Carolina in 2017, about 99% of the RHL of 5.50 million pounds (2,495 mt). According to the 2018 NEFSC data update (NEFSC 2018), about 0.90 million pounds (407 mt) of scup were discarded by recreational fishermen in 2017. According to these estimates, recreational catch in 2017 was 6.33 million pounds (2,849 mt), about 1% above the 2017 ACL of 6.25 million pounds (2,835 mt).

According to these estimates, the 2017 ABC was exceeded by 13%. These commercial and recreational overages mark a departure from trends in the fisheries during 2011-2016, as shown in Figure 1. The increase in discards between 2016 and 2017 was likely mainly due to the large 2015 year class, which is the largest year class since at least 1984. In 2017, these scup were very abundant, but mostly too small to be landed in the commercial fishery due to the commercial minimum fish size of 9 inches total length (Dr. Mark Terceiro, NEFSC, personal communication). An analysis of commercial scup discards through 2017 is included in an appendix to this document.



**Figure 1:** *Top:* total commercial and recreational catch, landings, and discards compared to ABCs. *Middle:* commercial landings compared to commercial quotas. *Bottom:* recreational harvest compared to RHLs.

The commercial scup quota is allocated among three quota periods: Winter I (January 1 – April 30, allocated 45.11% of the annual quota), Summer (May 1 – September, allocated 38.95% of the annual quota), and Winter II (October 1 – December 31, allocated 15.94% of the annual quota).<sup>2</sup> About 42% of the 2018 Winter I commercial scup quota was landed. As of June 23, 2018, 28% of the Summer commercial scup quota had been landed (Table 2).

**Table 2:** Commercial scup landings during the 2018 Winter I and Summer quota periods (through the week ending June 23, 2018), according to NMFS weekly landings reports. The Winter I quota is a coast-wide quota. The Summer period quota is allocated among states under the Commission’s FMP.

<b>State</b>	<b>Winter I</b> Landings (pounds) January 1 – April 28, 2018*	<b>Summer</b> Landings (pounds) May 1 – June 23, 2018*
Maine	0	0
New Hampshire	0	0
Massachusetts	536,100	301,591
Rhode Island	745,050	1,264,569
Connecticut	226,219	98,932
New York	1,133,110	821,485
New Jersey	1,443,524	80,653
Delaware	0	0
Maryland	34,932	0
Virginia	353,656	3,327
North Carolina	39,989	311
Other	0	0
<b>Total landings</b>	<b>4,512,580</b>	<b>2,570,868</b>
<b>Quota</b>	<b>10,820,000</b>	<b>9,294,233</b>

\*Note: The Winter I period lasts from January 1 through April 30. The Summer period lasts from May 1 through September 30. Landings in this table are from the NMFS quota monitoring site (<https://www.greateratlantic.fisheries.noaa.gov/aps/monitoring/scup.html>), which reports landings by week, rather than by quota period; thus, the Winter I landings shown above do not account for 100% of the 2018 Winter I landings.

### **2019 OFL and ABC Projections**

In 2015, the Council and Board set scup specifications for 2016-2018 based on the recommendations of the SSC and Monitoring Committee. The SSC derived their ABC recommendations from the Council’s risk policy and OFL projections provided with the 2015 benchmark stock assessment (NEFSC 2015). These projections assumed that 75% of the 2015 ABC would be caught and that F in 2016 and 2017 would be 0.22 ( $F_{MSY}$ ). The SSC assigned a 60% coefficient of variation (CV) to the OFL. The SSC used a 40% probability of overfishing ( $p^*$ ) to derive the 2016-2018 ABCs, based on the Council’s risk policy for a species with a typical life history.

<sup>2</sup> Prior to 2018, October was included in the summer quota period. The allocation percentages were the same as shown above.

The SSC revised their 2018 OFL and ABC recommendations and adopted a 2019 OFL and ABC in July 2018 after reviewing a stock assessment update provided by the NEFSC (NEFSC 2017). These ABC recommendations were based on biomass projections provided with the assessment update.

The projections assumed, based on patterns in the 2016 fishery, that 87% of the 2017 ABC would be caught and F in 2018 and 2019 would be 0.22 (i.e. the  $F_{MSY}$  proxy). The projections also used an OFL CV of 60% and a 40% probability of overfishing, based on the SSC’s previous OFL CV recommendation and application of the Council’s risk policy. This resulted in a 2019 OFL of 41.03 million pounds (18,612 mt) and a 2019 ABC of 36.43 million pounds (16,525 mt; Table 3).

**Table 3:** OFL, ABC, F, and SSB based on projections from the 2017 stock assessment update (NEFSC 2017) using an OFL CV of 60% and the Council’s risk policy ( $p^*=40\%$ ) and assuming that 87% of the ABC will be caught in 2017 and F would be at  $F_{MSY}$  proxy of 0.22 in subsequent years.

Year	OFL		ABC Catch		ABC Landings		ABC Discards		F	SSB	
	mil lb	mt	mil lb	mt	mil lb	mt	mil lb	mt		mil lb	mt
2017	24.70	11,206	24.70	11,206	19.76	8,962	4.95	2,244	0.112	404.10	183,296
2018	45.05	20,433	39.14	17,755	33.24	15,076	5.91	2,679	0.220	396.18	179,704
2019	41.03	18,612	36.43	16,525	31.35	14,221	5.08	2,304	0.220	361.84	164,129

The SSC considered the following to be the most significant sources of uncertainty in the 2015 benchmark assessment (MAFMC 2015A):

- While older age Scup (age 3+) are represented in the catch used in the assessment model, most indices used in the model do not include ages 3+. As a result, the dynamics of the older ages of scup are driven principally by catches and inferences regarding year class strength.
- Uncertainty exists with respect to the estimate of natural mortality used in the assessment.
- Uncertainty exists as to whether the MSY proxies ( $SSB_{40\%}$ ,  $F_{40\%}$ ) selected and their precisions are appropriate for this stock.
- The SSC assumed that OFL has a lognormal distribution with a 60% CV, based on a meta-analysis of survey and statistical catch at age model accuracies.
- Survey indices are particularly sensitive to scup availability, which results in high inter-annual variability. Efforts were made to address this question in the Stock Assessment Workshop and Stock Assessment Review Committee (SAW/SARC) that should be continued; and
- The projection on which the ABC was determined is based on an assumption that the quotas would be landed in 2016, 2017, and 2018.

**Stock Status and Biological Reference Points**

Biological reference points estimated by the 2015 benchmark scup stock assessment include (NEFSC 2015):

- A biomass reference point of  $SSB_{MSY\ proxy} = SSB_{40\%} = 192.47$  million pounds (87,302 mt)
- A minimum biomass threshold of  $\frac{1}{2} SSB_{MSY\ proxy} = \frac{1}{2} SSB_{40\%} = 96.23$  million pounds (43,651 mt)
- A fishing mortality reference point of  $F_{MSY\ proxy} = F_{40\%} = 0.220$ .

Based on the 2017 stock assessment update, the scup stock was not overfished and overfishing was not occurring in 2016 relative to the biological reference points from the 2015 benchmark stock assessment. SSB was estimated to be about 397 million pounds (179,898 mt) in 2016, about 2.1 times the SSB<sub>MSY</sub> proxy reference point (i.e. SSB<sub>40%</sub>) of 192 million pounds (87,302 mt). Fishing mortality on fully selected age 3 scup was 0.139 in 2016, about 63% of the F<sub>MSY</sub> proxy reference point (i.e. F<sub>40%</sub>) of 0.220. At 252 million fish, the 2015 year class was estimated to be the largest since at least 1984 and about 2.1 times the average recruitment (i.e. number of age 0 scup) over 1984-2016. The 2016 year class was estimated to be about 46% below the 1984-2016 average at 65 million fish (NEFSC 2015, NEFSC 2017).

According to the 2018 data update from the NEFSC (NEFSC 2018), the NEFSC bottom trawl survey biomass indices for scup in fall 2015 and spring 2016 were record highs for the time series (i.e. 1963 - present for the fall survey and 1968 through the present for the spring survey). Both seasonal indices decreased after 2016. Several state fisheries-independent surveys show similar trends.

### **Other Management Measures**

#### ***Commercial and Recreational Annual Catch Limits (ACLs)***

As specified in the FMP, 78% of the ABC is allocated to the commercial fishery as a commercial ACL and 22% is allocated to the recreational fishery as a recreational ACL (Figure 2). ACLs include both landings and discards. The 2019 commercial ACL is 28.42 million pounds (12,890 mt) and the 2019 recreational ACL is 8.01 million pounds (3,636 mt; Table 1).

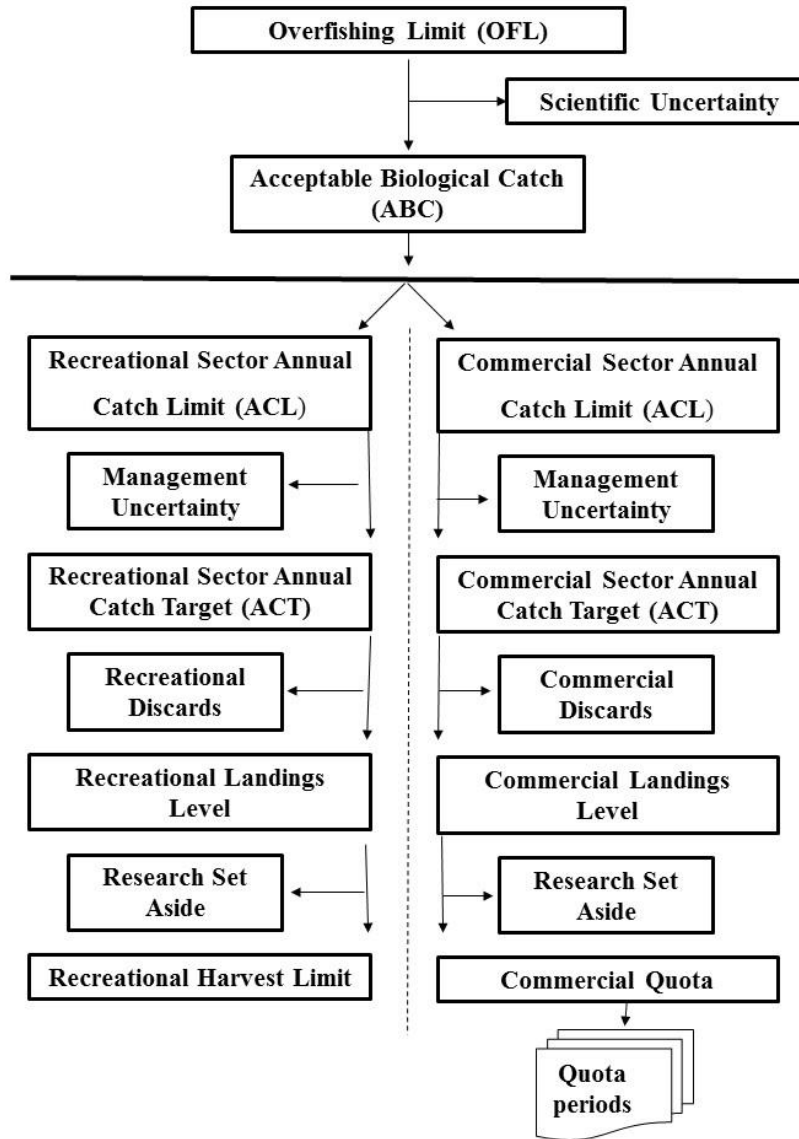
#### ***Annual Catch Targets (ACTs)***

The Monitoring Committee recommends ACTs for the Council and Board's consideration. ACTs may be either equal to the ACLs or reduced from the ACLs to account for management uncertainty. Management uncertainty can include uncertainty in the ability of managers to control catch and uncertainty in quantifying the true catch (i.e. estimation errors). This can occur due to a lack of sufficient information about catch (e.g. due to late reporting, under-reporting, and/or misreporting of landings or discards) or due to a lack of management precision (i.e. the ability to constrain catch to desired levels).

At their July 2017 meeting, the Monitoring Committee reviewed the SSC's recommendations for 2018 and 2019 ABCs and noted that the revised 2018 ABC represented a 45% increase over the previously implemented 2018 ABC. The Monitoring Committee recommended taking a less substantial increase of 22.5% at the ACT level for 2018 and setting the 2019 ACTs equal to the 2018 ACTs. The Monitoring Committee noted potential management uncertainty associated with changes to the scup commercial quota period dates in 2018. The shift of October from the Summer to the Winter II period may impact total commercial landings and the distribution of landings by state. In addition, revisions to the MRIP time series of recreational catch data, planned to be released in July 2018, could also introduce a source of management uncertainty. The Monitoring Committee expressed concern that drastic catch limit increases have the potential to be followed by large cutbacks, especially given the uncertainty in how the MRIP revisions will impact the stock assessment. More moderate changes, as opposed to large swings in quota, provide for more stability in the fisheries.

Ultimately, the Council and Board did not accept the Monitoring Committee's recommendation, and instead recommended setting the 2019 ACL equal to the ACT. They also recommended setting the 2018

ACT equal to the 2019 ACT, which resulted in a slightly lower 2018 ACT than if the ACT had been set equal to the 2018 ACL. This resulted in stable ACTs, commercial quotas, and RHLs between 2018 and 2019 (Figure 1).



**Figure 2:** Scup catch and landings limit calculation methodology. The Research Set Aside program was suspended in 2014.

***Commercial Quotas and Recreational Harvest Limits (RHLs)***

Commercial scup quotas and RHLs are calculated by subtracting projected discards from the sector-specific ACTs. Projected discards from the stock assessment are apportioned between commercial and recreational fisheries using the average percent of dead discards attributable to each sector over the past three years. According to the 2017 assessment update (NEFSC 2017), commercial discards accounted for an average of 87.3% and recreational dead discards accounted for an average of 12.7% of all dead



discards from 2014 through 2016. These values were used to calculate the 2019 commercial quota of 23.98 million pounds (10,879 mt) and RHL of 7.37 million pounds (3,342 mt).

As previously stated, the commercial scup quota is allocated among three quota periods: Winter I (January 1 – April 30, allocated 45.11% of the annual quota), Summer (May 1 – September, allocated 38.95% of the annual quota), and Winter II (October 1 – December 31, allocated 15.94% of the annual quota). Assuming no changes to the annual 2019 quota, the 2019 Winter I quota will be about 10.81 million pounds (4,903 mt), the Summer period quota will be about 9.34 million pounds (4,237 mt), and the Winter II quota will be about 3.82 million pounds (1,733 mt).

### ***Commercial Winter I and Winter II Quota Period Possession Limits***

Commercial possession limits are designed to help constrain landings to the seasonal period quotas. The Winter I possession limit is 50,000 pounds. After 80% of the Winter I quota is landed, the possession limit drops to 1,000 pounds. The Winter II possession limit is initially set at 12,000 pounds. If the Winter I quota is not fully harvested, the Winter II possession limit increases by 1,500 pounds for every 500,000 pounds of scup not landed during the Winter I period. There are no federal possession limits during the Summer quota period; however, there are state possession limits.

Most commercial scup trips in recent years landed well below the Winter I and Winter II possession limits. These possession limits have not been modified since 2012, when the Winter I limit increased from 30,000 to 50,000 pounds and 2014 when the initial Winter II limit increased from 2,000 to 12,000 pounds. In recent years, some advisors have said that the current Winter I possession limit can cause markets to be flooded with scup, which can lead to a decrease in price. However, many advisors support status quo possession limits and the Monitoring Committee has not recommended changes in recent years. Advisors did not comment on the commercial scup possession limits at their June 2018 meeting. Staff recommend no changes to the Winter I and Winter II possession limits for 2018.

### ***Commercial Minimum Fish Size***

The minimum size for retention of scup in the commercial fishery is 9 inches total length. This measure was first implemented in 1996, when scup were first managed by the Council and Commission. The Council and Board considered modifying this measure in 2005, 2012, and in 2015. After reviewing this measure in detail 2015, the Monitoring Committee, Council, and Board all recommended no changes. The rationale for this recommendation is described in MAFMC 2015B. Advisors have expressed differing opinions on the commercial minimum fish size for scup in the past (e.g. MAFMC 2017b); however, they did not comment on this measure during their June 2018 meeting. Staff recommend that this regulation remain unchanged in 2019.

### ***Commercial Trawl Mesh Size***

Trawl vessels which possess more than 1,000 pounds of scup from November 1 through April 30 and more than 200 pounds of scup from May 1 through October 31 must use a minimum mesh size of 5.0 inches. In late 2015, the Council approved an increase in the November-April incidental limit from 500 to 1,000 pounds in recognition of the substantial increase in SSB and expansion of the age structure of the population since this measure was last modified in 2004.

In June 2018, the Council received a request from the states of Massachusetts and Rhode Island to consider an increase in the incidental scup possession limit during April 15 - June 15 (or alternatively, May 1 - June 30) to 4,000 pounds to accommodate their spring inshore squid fisheries, which use mesh smaller than 5 inches in diameter. This would allow the squid fisheries to land more of the scup which they catch incidentally, rather than discarding them.<sup>3</sup> The Monitoring Committee will review this request and make a recommendation during their July 2018 meeting.

Summer flounder, scup, and black sea bass are all currently managed with different minimum mesh sizes (i.e. 5.5” diamond or 6” square for summer flounder, 5” diamond for scup, and 4.5” diamond for black sea bass). A study by Hasbrouck et al. (2018) confirmed that the current minimum mesh sizes for all three species are effective at releasing most fish smaller than the commercial minimum sizes (i.e. 14” total length for summer flounder, 9” total length for scup, and 11” total length for black sea bass). One goal of the Hasbrouck et al. study was to evaluate the potential for a common mesh size across all three species. The study was not able to identify a common mesh size for all three species that would be effective at minimizing discards under the current minimum fish size limits. However, the authors concluded that a common mesh size of 4.5” or 5” diamond for scup and black sea bass would be effective at releasing undersized fish.

Council staff recommend no changes to the minimum mesh sizes for 2019. The Monitoring Committee will review the results of Hasbrouck et al. (2018) during their July 2018 meeting. If the Council wishes to consider modifications to the minimum mesh sizes, the objectives should be clarified. Possible objectives could include establishing a common minimum mesh size, minimizing discards, and/or maintaining or increasing catches of legal-sized fish; however, some of these objectives may be at odds with each other. Input from the commercial fishing industry should be sought before any minimum mesh size changes are considered. As the Monitoring Committee has noted in the past, changes to these requirements can create an economic burden for fishermen if they necessitate purchase of new nets.

### ***Commercial Pot and Trap Regulations***

NMFS Vessel Trip Report data show that about 1% of the 2017 commercial scup catch was taken with pots and traps. Pots and traps used in the commercial scup fishery must have either a circular escape vent with a 3.1 inch minimum diameter or square or rectangular escape vents with each side being at least 2.25 inches in length. The Council and Commission hosted a workshop in 2005 to review several studies on vent size. Workshop participants did not recommend any changes in the vent sizes for the commercial scup fishery. The Monitoring Committee reviewed these measures in 2015 and recommend no changes (MAFMC 2015B). Staff recommend no changes to these measures for 2019.

### ***Recreational Seasons, Possession Limits, and Minimum Size***

The Council and Board will discuss 2019 recreational scup seasons, possession limits, and minimum fish sizes at their joint meeting in December 2018. Data from the first four “waves” (i.e. the two-month reporting increments for recreational data) of 2018 recreational landings are expected to be available in October 2018. The Monitoring Committee will meet in November to review these landings data and make recommendations for any necessary changes in recreational management measures. Staff have no recommendations for 2019 recreational management measures at this time.

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<sup>3</sup> The full request is available at: <http://www.mafmc.org/council-events/2018/sfsbsb-monitoring-committee-meeting>

## **References**

Hasbrouck, E., S. Curatolo-Wagemann, T. Froelich, K. Gerbino, D. Kuehn, P. Sullivan, J. Knight. 2018. Determining Selectivity and Optimum Mesh Size to Harvest Three Commercially Important Mid-Atlantic Species - A Report to the Mid-Atlantic Fishery Management Council and the Atlantic States Marine Fisheries Commission. Available at: [http://www.mafmc.org/s/Tab08\\_SFSBSB-Mesh-Selectivity-Study-Apr2018.pdf](http://www.mafmc.org/s/Tab08_SFSBSB-Mesh-Selectivity-Study-Apr2018.pdf)

MAFMC (Mid-Atlantic Fishery Management Council). 2015A. Report of the July 2015 Meeting of the MAFMC SSC. Available at: <http://www.mafmc.org/ssc>

MAFMC (Mid-Atlantic Fishery Management Council). 2015B. Summer Flounder, Scup, and Black Sea Bass Commercial Management Measures Review. Available at: <http://www.mafmc.org/briefing/december-2015>

MAFMC (Mid-Atlantic Fishery Management Council). 2018A. Scup Fishery Information Document. Available at: <http://www.mafmc.org/sf-s-bsb/>

MAFMC (Mid-Atlantic Fishery Management Council). 2018B. Summer Flounder, Scup, and Black Sea Bass Fishery Performance Reports. Available at: <http://www.mafmc.org/sf-s-bsb/>

NEFSC (Northeast Fisheries Science Center). 2015. 60<sup>th</sup> Northeast Regional Stock Assessment (60<sup>th</sup> SAW) Assessment Report. Northeast Fisheries Science Center Reference Document 15-08. Available at: <http://www.nefsc.noaa.gov/publications/>

NEFSC (Northeast Fisheries Science Center). 2016. Scup Data Update for 2016. Available at: <http://www.mafmc.org/council-events/2016/ssc-3>.

NEFSC (Northeast Fisheries Science Center). 2017. Scup Assessment Update for 2017. Available at: <http://www.mafmc.org/ssc-meetings/2017/july-19-20>.

NEFSC (Northeast Fisheries Science Center). 2018. Scup Data Update for 2018. Available at: <http://www.mafmc.org/council-events/2018/july-2018-ssc-meeting>.

## **APPENDIX**

### **Commercial Fishery Scup Discard Evaluation, 2001-2017**

#### **Background**

- Trawl discards are estimated by calendar quarter, statistical area, and three mesh categories: large (i.e. 5” or greater), small (i.e. smaller than 5” but larger than 2.125”), and squid (i.e. 2.125” or less). Estimated discards are calculated using observer, VTR, and dealer data (NEFSC 2015).
- The scup GRAs were first effective November 2000. The Southern GRA is effective January 1 - March 15. The Northern GRA is effective November 1 - December 31.
- The most recent change in boundary of southern scup GRA became effective January 1, 2017 (Figure 1).
- Effective January 1, 2016, the incidental scup possession limit for trawl vessels using mesh smaller than 5 inches in diameter during November-April increased from 500 pounds to 1,000 pounds. This change was intended to reduce scup discards.
- The 2015 year class was estimated to be 252 million fish, about 2.1 times the average recruitment from 1984 to 2016. It appears to be the largest year class in the assessment time series since at least 1984. In 2017, these fish were mostly too small (< 8 inches/ <20 cm) to be landed in the commercial fishery (NEFSC 2018; Dr. Mark Terceiro, NEFSC, personal communication; Figure 2).

#### **Results**

- Total estimated scup discards from all mesh sizes were 4,727 mt (10.42 million pounds) in 2017, the highest since 1981 and about 71% higher than in 2016 (Figure 3, NEFSC 2018).
- On average, during 2001-2017, squid mesh discards accounted for 41% of all estimated scup discards, while small mesh accounted for 30%, and large mesh accounted for 29%. In 2017, squid mesh accounted for 50% of total estimated scup discards, small mesh accounted for 23%, and large mesh accounted for 27% (Figure 3).
- Between 2016 and 2017, scup discards with large mesh doubled (i.e. an increase of 100%). Discards with small mesh increased by 41% and discards with squid mesh increased by 73% (Figure 3).
- Estimated discards with squid and small mesh were variable, but generally decreased in the GRA statistical areas during the times when the GRAs were in effect. The northern GRA has been in effect during November and December since 2000. Estimated scup discards by squid and small mesh in the northern GRA statistical areas during the fourth quarter of the year averaged 456 mt before 2000 and 171 mt from 2000 through 2017 (Figure 4). The southern GRA has been in effect during January 1 - March 15 since 2001. Estimated scup discards by squid and small mesh in the southern GRA statistical areas during the first quarter of the year averaged 344 mt before 2001 and 242 mt from 2001 through 2017 (Figure 5).
- Between 2016 and 2017, scup discards in statistical areas which are partially included in the southern GRA increased by 148%. Within these statistical areas, squid mesh scup discards increased by 182%, small mesh discards increased by 70%, and large mesh discards increased by 206% (Figure 6 and Figure 7)

- Between 2016 and 2017, scup discards in statistical areas which are partially included in the northern GRA increased by 62%. Within these statistical areas, squid mesh scup discards increased by 53%, small mesh discards increased by 57%, and large mesh discards increased by 85% (Figure 6 and Figure 7).
- Total scup discards with all mesh sizes steadily increased from 2014 through 2017. This trend closely mirrors the trend in recruitment during 2012-2015 (Figure 8 and Figure 9).
- In general, most scup discards occurred in GRA statistical areas, though not necessarily during the times of year when the GRAs are in place or with mesh sizes regulated by the GRAs. In all years from 2001 through 2017, at least 50% (with an average of 76%) of all scup discards from all mesh sizes occurred in statistical areas which are partially included in either the GRAs. On average, since both GRAs have been in place, the northern GRA areas accounted for 49% of all scup discards and the southern GRA areas accounted for 26% of all scup discards (Figure 6).
- Over the past 5 years (i.e. 2013-2017), squid mesh discards in southern GRA statistical areas, as a percentage of all estimated squid mesh scup discards, were below average (i.e. 3% on average for 2013-2017 vs. 16% for 2001-2017). Squid mesh scup discards in the southern GRA statistical areas were 5% of total squid mesh scup discards in 2017, slightly higher than in the previous four years. Squid mesh scup discards in northern GRA statistical areas during 2013-2017 were equivalent to the 2001-2017 average of 53%. In 15 of the past 17 years, squid mesh scup discards were higher in the northern GRA statistical areas than in the southern GRA statistical areas (Figure 7).
- When examining only the southern GRA statistical areas, during 2001-2017, most squid mesh discards occurred in statistical area 616, which includes Hudson Canyon (Figure 10).
- During 2013-2017, large mesh accounted for most scup discards in the southern GRA statistical areas, averaging 65% of total scup discards per year in those areas, compared to 10% for squid mesh and 26% for small mesh (Figure 11).
- During 2013-2017, squid mesh accounted for most scup discards in the northern GRA statistical areas, averaging 49% of total scup discards per year in those areas, compared to 25% for small mesh and 26% for large mesh (Figure 12).
- Seasonal patterns in scup discards varied by year. During 2001-2017, discards from all mesh sizes in the first quarter of the year averaged 24% of total annual scup discards; however, there was considerable year-to-year variability (Figure 13). Discards in the second quarter averaged 31%. Discards in the third quarter averaged 13% and discards in the fourth quarter averaged 32%. Most squid mesh and small mesh discards occurred in quarter 2 (37% and 33%, respectively), when neither GRA is in effect. Most large mesh discards occurred in quarter 4 (44%; Figure 14).

## Conclusions

- The high scup discards in 2017 were likely the result of the record high recruitment in 2015 (Figure 9).

- Between 2016 and 2017, scup discards in southern GRA statistical areas increased by a greater amount than discards in all statistical areas (i.e. 148% vs. 71%). This increase was driven by discards with large mesh (increase of 206%), small mesh (increase of 70%), and squid mesh (increase of 182%). Only squid and small mesh are regulated by the GRAs. The change in the southern GRA boundary in 2017 may have played a role in the increase in scup discards; however, recruitment likely had a greater impact on discards.
- Patterns in scup discards in squid and small mesh fisheries since 1989 suggest that implementation of the GRAs led to a reduction in scup discards in those fisheries (Figure 4 and Figure 5).
- Increased, targeted fishing effort toward scup may also have played a role, as the fleets attempt to catch the increased quotas. However, given the multispecies nature of the major mid-Atlantic trawl fisheries (e.g. summer flounder, scup, black sea bass, squid, mackerel, and butterfish), it would be difficult to tease out how multispecies effort (trips or days fished) relates directly to discards (Dr. Mark Terceiro, NEFSC, personal communication).

**Figures**

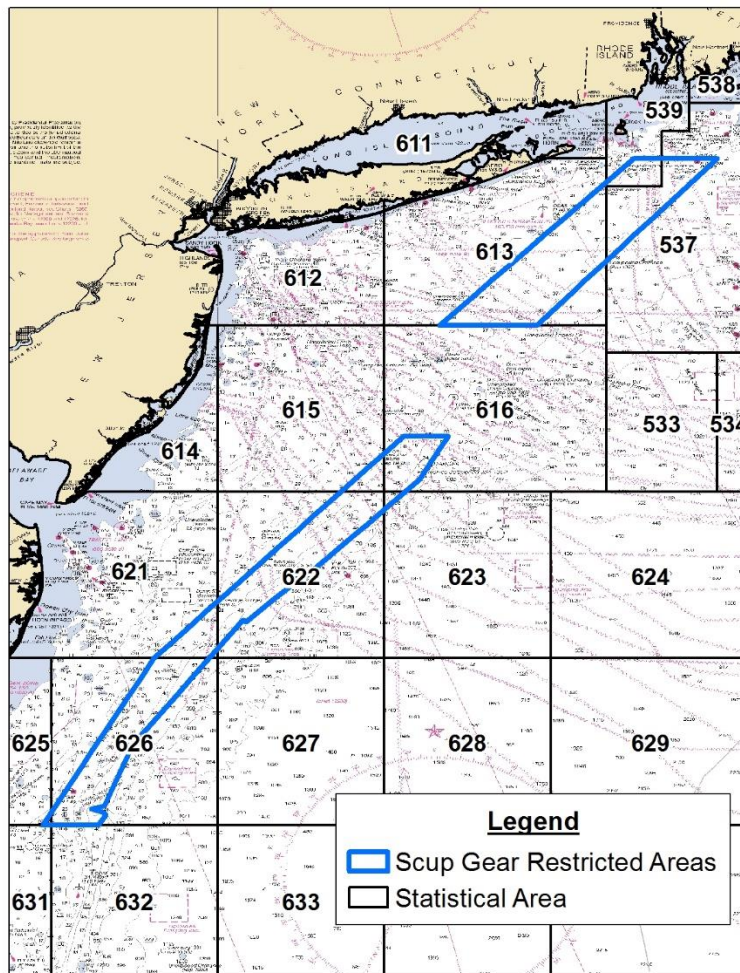


Figure 1: Scup GRAs and NMFS statistical areas.

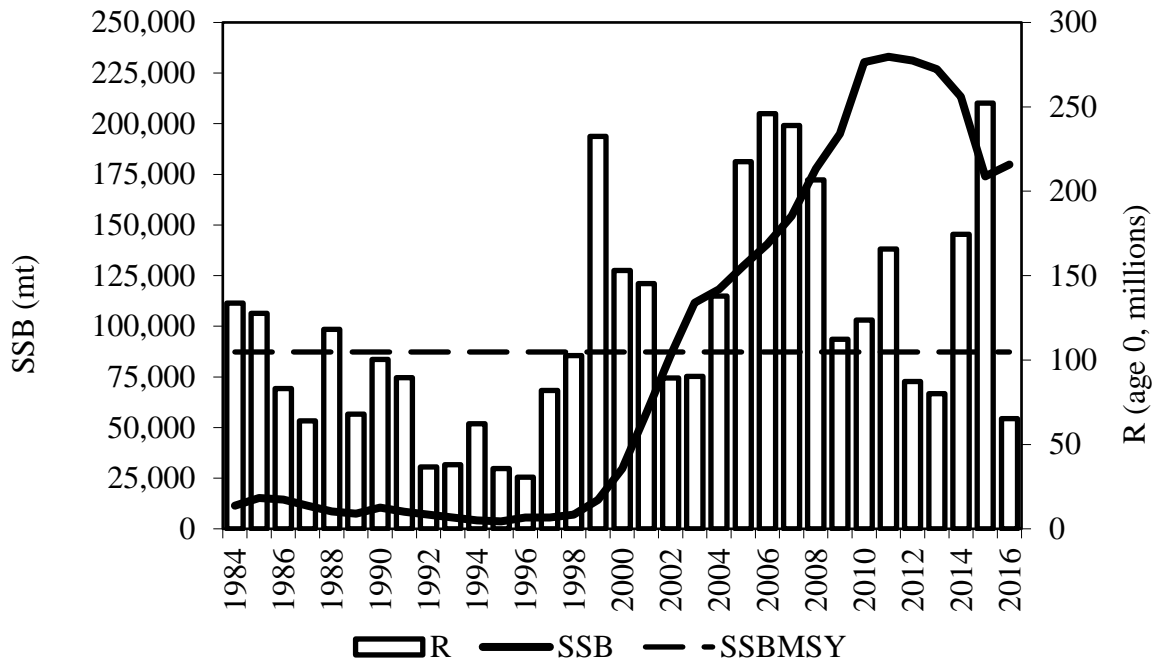


Figure 2: Spawning Stock Biomass (SSB; solid line) and Recruitment (R at age 0; vertical bars) for scup. The horizontal dashed line is the  $SSB_{MSY}$  proxy =  $SSB_{40\%}$  = 87,302 mt from the 2015 benchmark stock assessment. Source: NEFSC 2017.

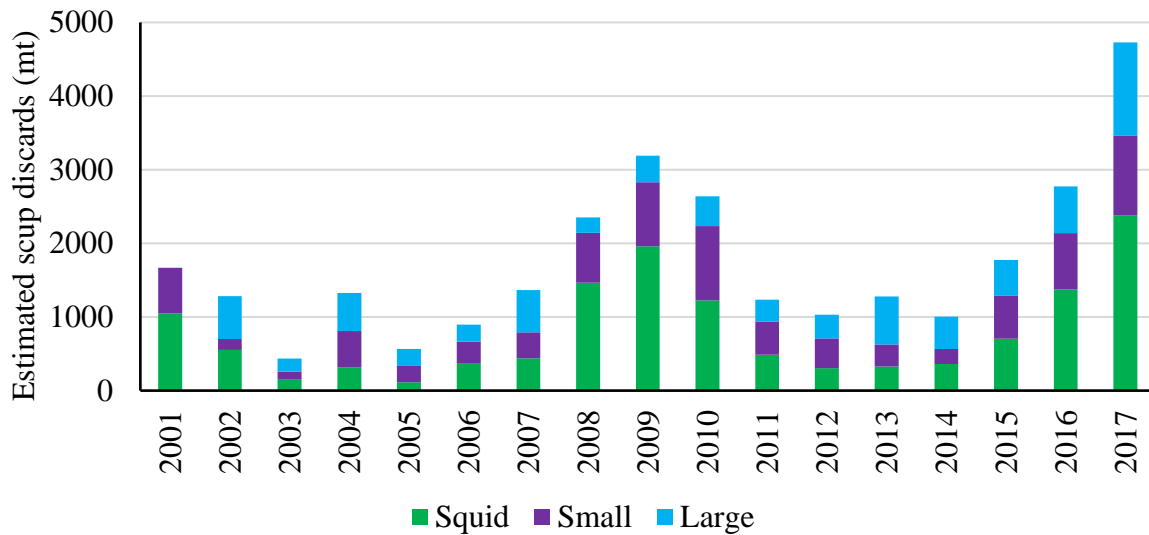


Figure 3: Estimated scup discards by year and mesh size.

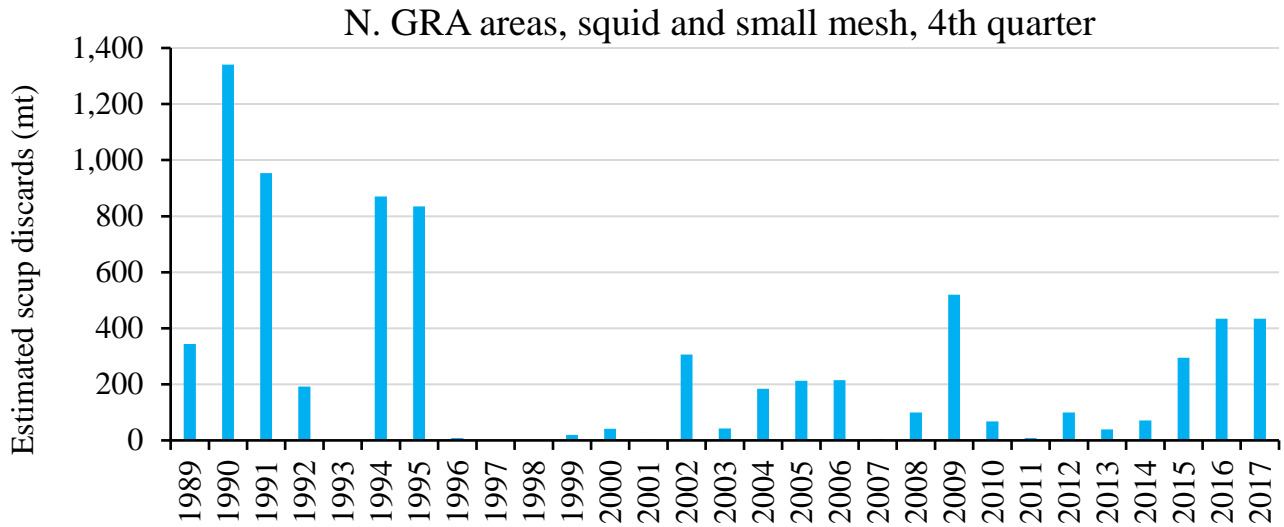


Figure 4: Estimated scup discards from squid and small mesh during the fourth quarter of the year in statistical areas which are partly included in the northern scup GRA. The northern GRA has been in effect during November and December since 2000.

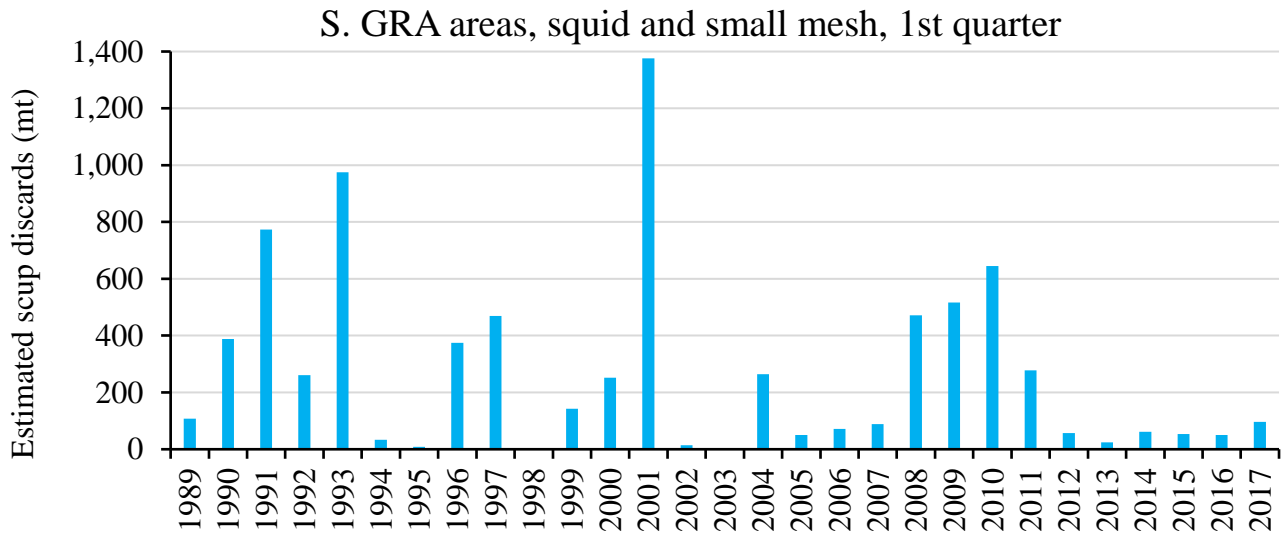


Figure 5: Estimated scup discards from squid and small mesh during the first quarter of the year in statistical areas which are partly included in the southern scup GRA. The southern GRA has been in effect during January 1 - March 15 since 2001.



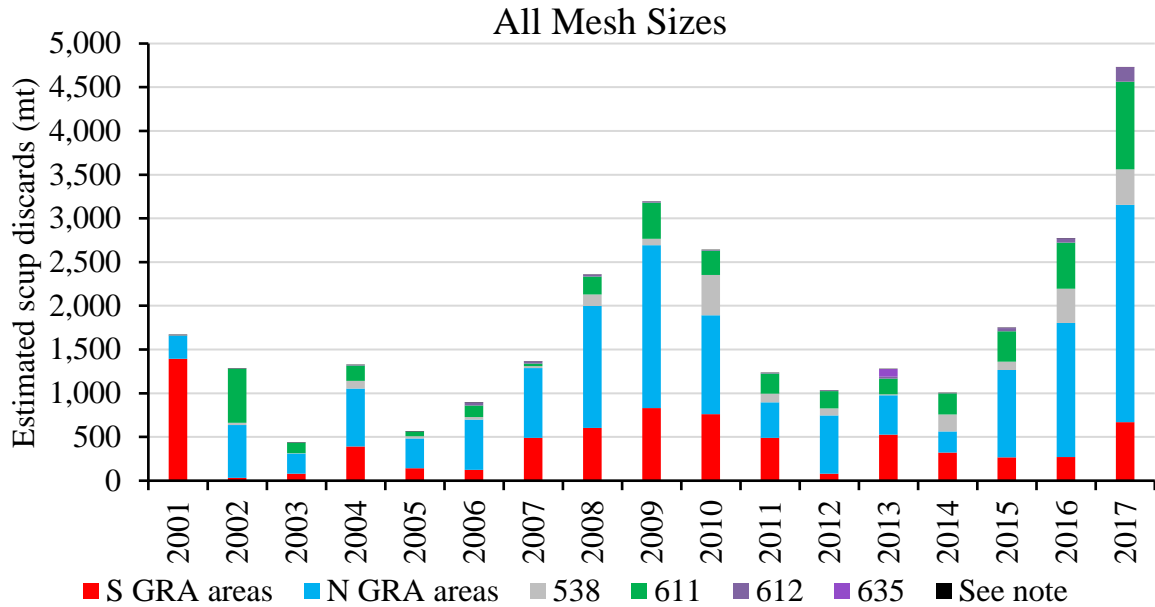


Figure 6: Estimated scup discards by year and statistical area for all mesh sizes. *Note:* statistical areas which are not part of the GRAs and which had less than 100 mt of estimated scup discards during 2001-2016 are grouped together (i.e. areas 513, 514, 515, 521, 522, 525, 526, 561, 562, 614, 627, and 636). Statistical areas with no estimated scup discards are not shown.

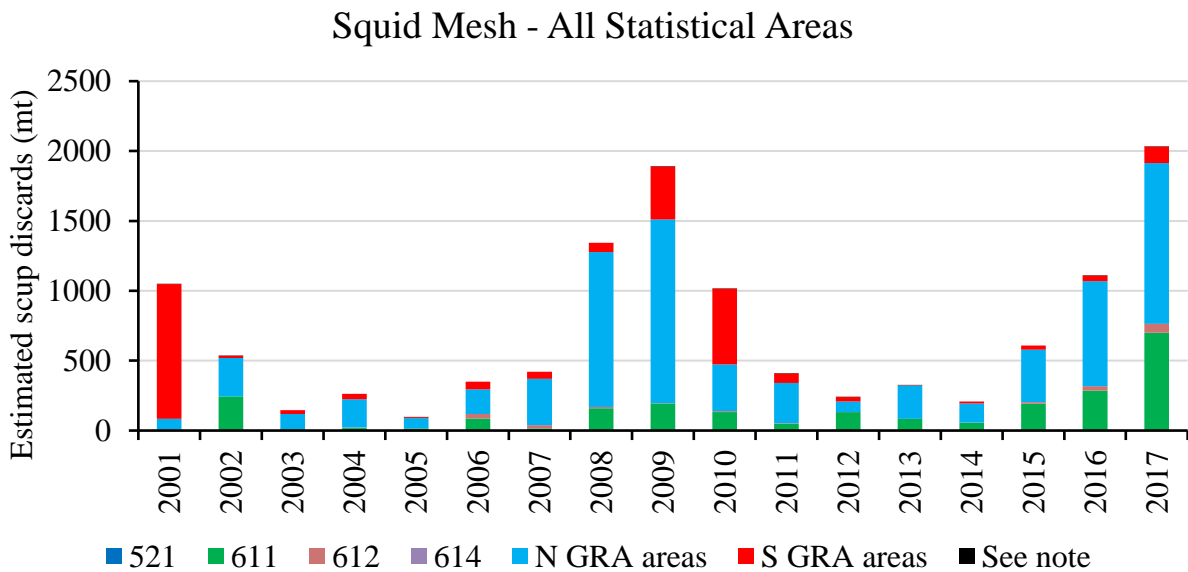


Figure 7: Estimated scup discards by year and statistical area for trawl vessels using codend mesh diameters of 2.125 inches or less (aka “squid mesh”). *Note:* all statistical areas with less than 1 mt total estimated squid mesh scup discards over 2001-2017 are grouped together (i.e. areas 513, 514, 515, 522, 525, 526, 562, 627, 632, 635, 636). Statistical areas with no estimated scup discards in squid mesh are not shown.

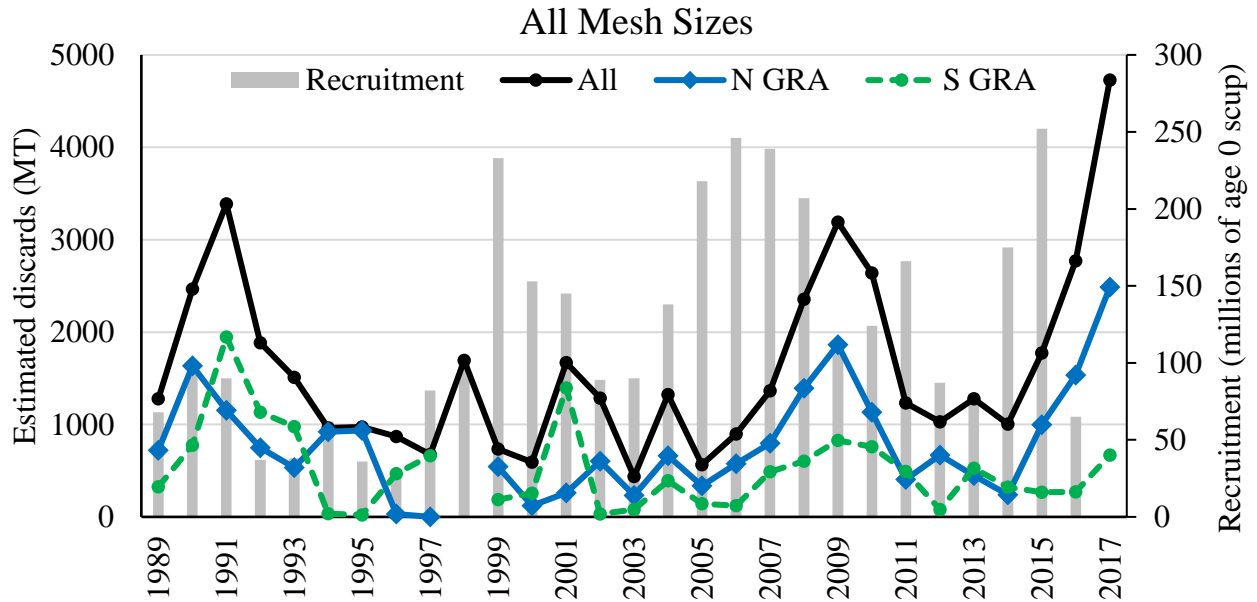


Figure 8: Estimated scup discards and recruitment. Discards are shown for all mesh sizes in all statistical areas, statistical areas partially included in the northern scup GRA, and statistical areas partly included in the southern scup GRA. Data on recruitment in 2017 are not currently available. The 1998 total discard estimate was modified to adjust for the influence of one unreasonably large tow (NEFSC 2015). Similar adjustments were not made by statistical area, therefore 1998 discard estimates by GRA areas are not shown.

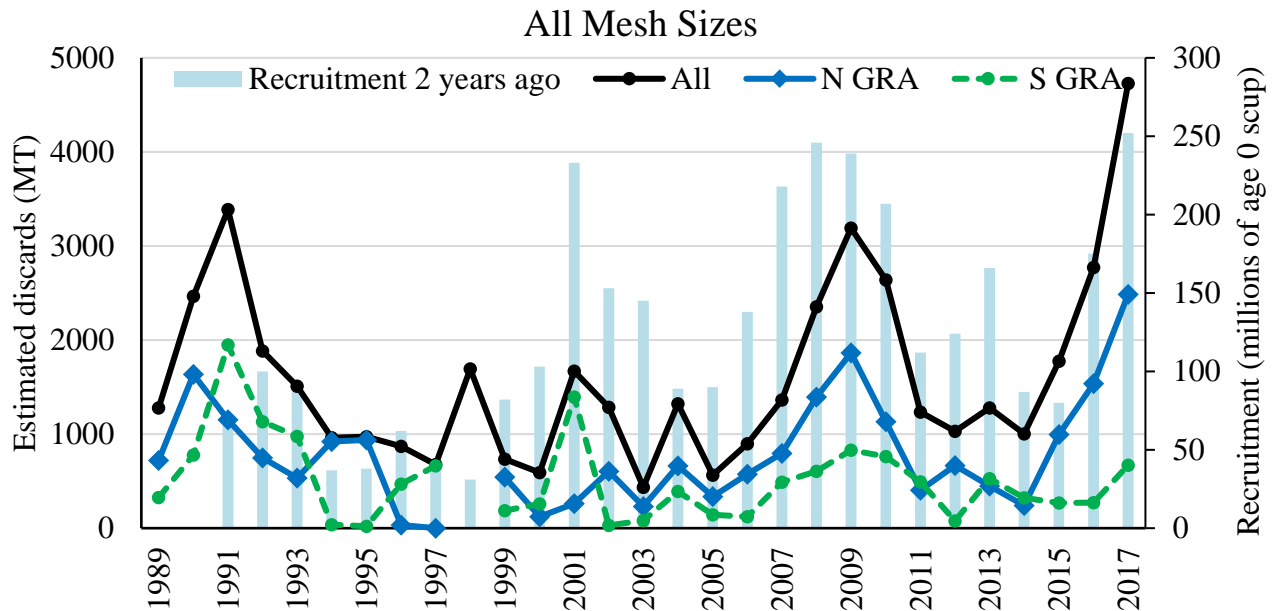


Figure 9: Estimated scup discards and recruitment from two years prior (e.g. 2015 recruitment is shown in 2017). Discards are shown for all mesh sizes in all statistical areas, statistical areas partially included in the northern scup GRA, and statistical areas included in the southern scup GRA. The 1998 total discard estimate was modified to adjust for the influence of one unreasonably large tow (NEFSC 2015). Similar adjustments were not made by statistical area, therefore 1998 discard estimates by GRA areas are not shown.

### Squid Mesh - Southern GRA

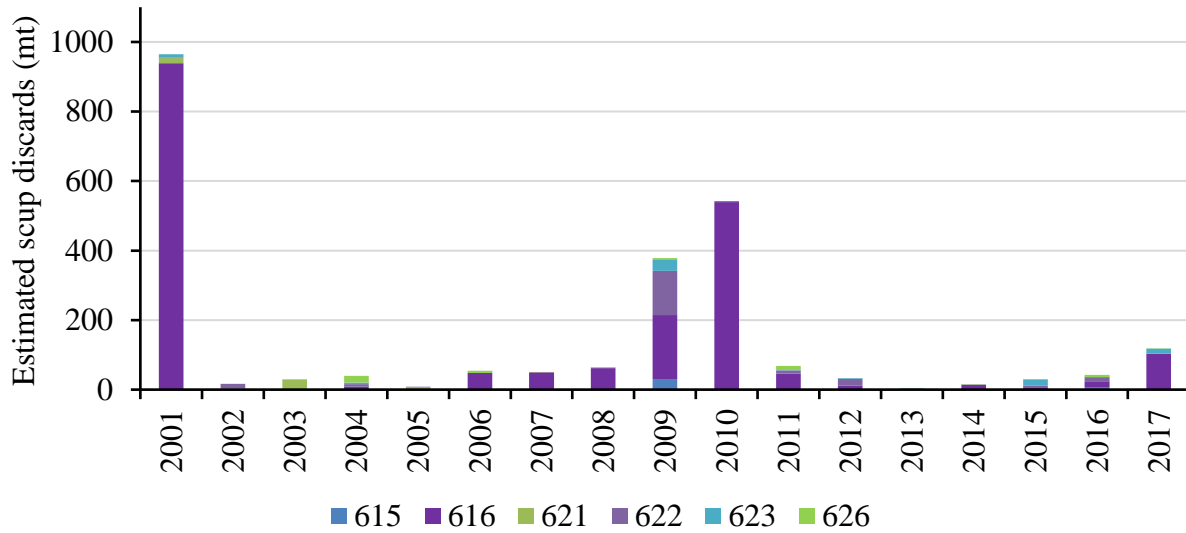


Figure 10: Estimated scup discards by year and statistical area for trawl vessels using codend mesh diameters of 2.125 inches or less (aka “squid mesh”). Only statistical areas which are partially included in the southern scup GRA are shown. Statistical areas with no estimated squid mesh scup discards are not shown (i.e. statistical areas 625, 631, and 632).

### Discards from southern GRA statistical areas

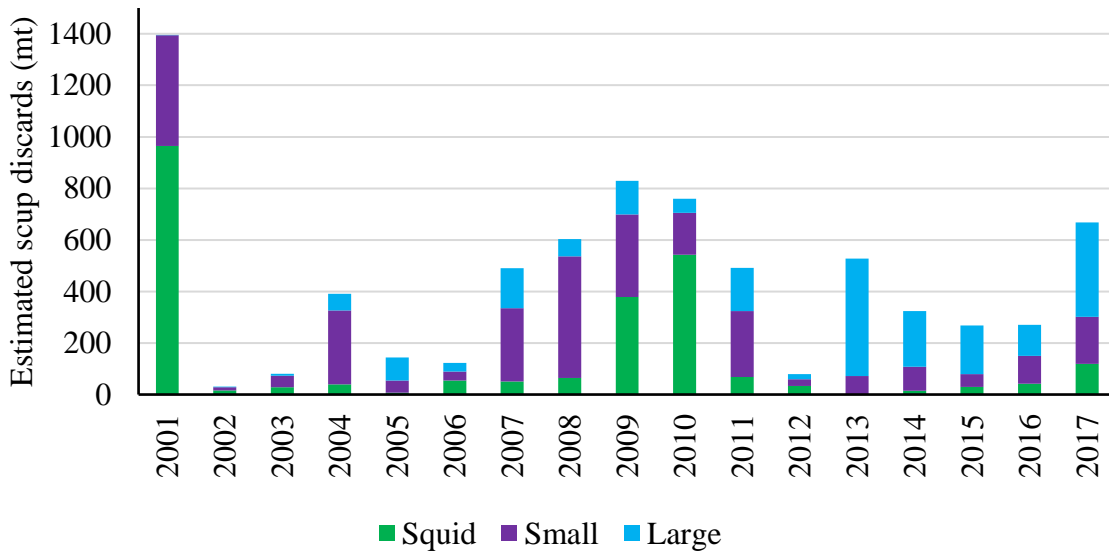


Figure 11: Estimated scup discards by year and mesh size for statistical areas which are partially included in the southern scup GRA.

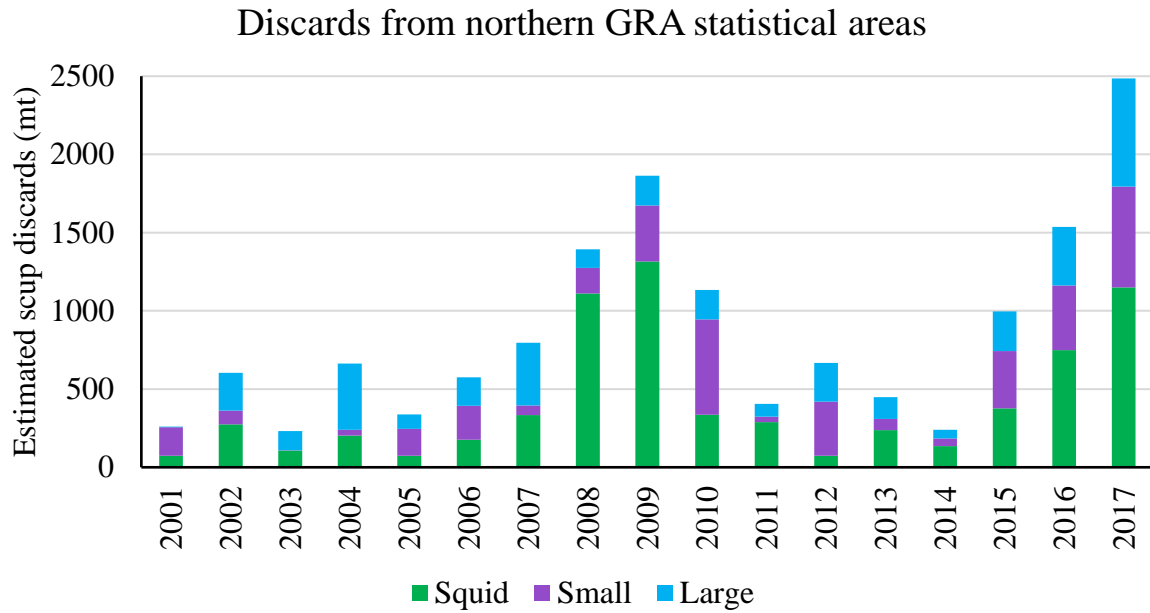


Figure 12: Estimated scup discards by year and mesh size for statistical areas which are partially included in the northern scup GRA.

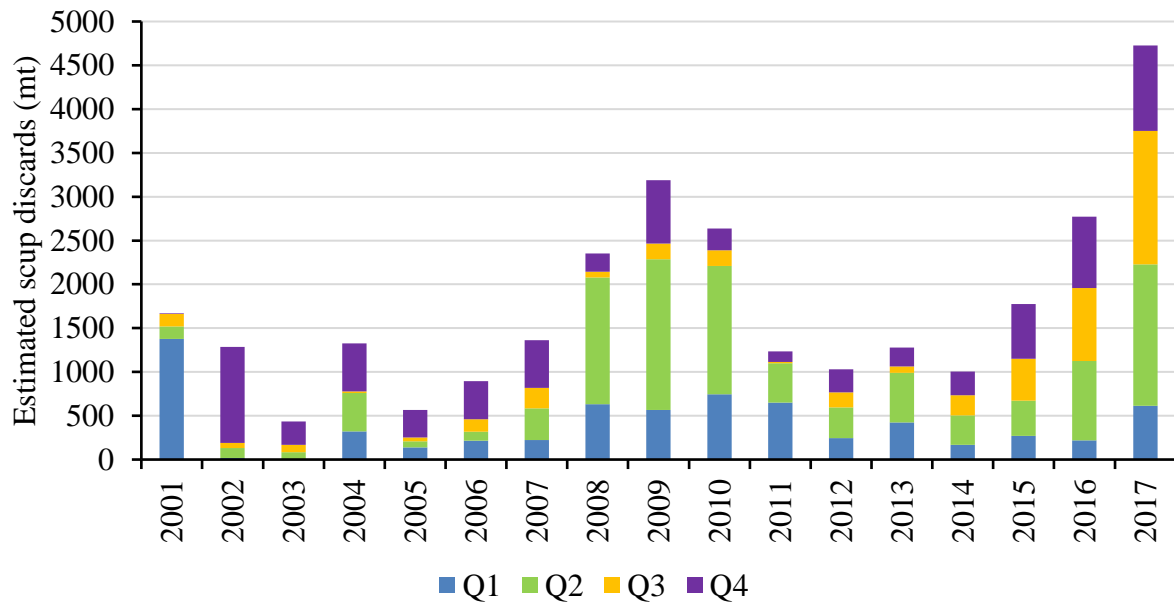


Figure 13: Estimated scup discards for all mesh categories by calendar quarter and year.

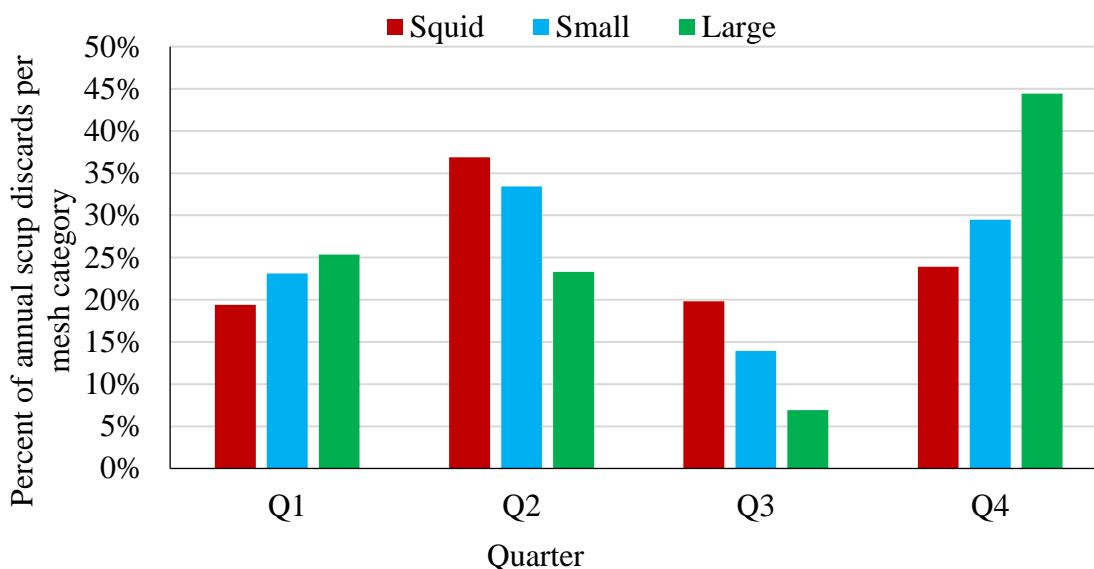


Figure 14: Average percent of annual scup discards per quarter for each of three mesh categories (squid, small, and large), 2001-2017.

### Appendix References

NEFSC (Northeast Fisheries Science Center). 2015. SARC 60 Scup Working Paper - TOR 1: Estimates of Commercial Fishery Scup Discards: 1989-2013.

NEFSC (Northeast Fisheries Science Center). 2017. Scup Assessment Update for 2017. Available at: <http://www.mafmc.org/ssc-meetings/2017/july-19-20>.

NEFSC (Northeast Fisheries Science Center). 2018. Scup Data Update for 2018. Available at: <http://www.mafmc.org/ssc-meetings/2018/july-17-18>