



Mid-Atlantic Fishery Management Council

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MEMORANDUM

Date: January 28, 2016
To: Council
From: Julia Beaty
Subject: Scup Gear Restricted Areas Framework

Contents

This document summarizes the management alternatives approved by the Council for inclusion in the Scup Gear Restricted Areas (GRA) Framework, as well as additional alternatives recently proposed by advisors.

Two additional documents are included with this tab:

- Summary of the January 2016 meeting of the Summer Flounder, Scup, and Black Sea Bass Advisory Panel (AP) and the Mackerel, Squid, and Butterfish AP
- A white paper on commercial fishery scup discards in the GRAs (Terceiro and Miller 2014)

Background

In 2000 the Council implemented two Gear Restricted Areas (GRAs) with the intent of reducing scup discards in small mesh fisheries. The Council modified the boundaries of the GRAs in late 2000, in 2001, and in 2005. The current boundaries are shown in Figure 1. Under the current regulations, trawl vessels in the Southern GRA from January 1 through March 15 that fish for or possess longfin squid, black sea bass, or silver hake/whiting (listed in the regulations as “non-exempt species”) must fish with nets that have a minimum mesh size of 5.0-inch diamond mesh, applied throughout the codend for at least 75 continuous meshes forward of the terminus of the net.¹ The same applies for trawl vessels in the Northern GRA from November 1 through December 31 (50 CFR 648.124).

In December 2015 the Council approved a range of management alternatives for a framework action to modify the scup GRAs. The Summer Flounder, Scup, and Black Sea Bass Advisory Panel (AP) and the Mackerel, Squid, and Butterfish AP met in January 2016 to provide feedback to the Council on the GRA framework. The Council planned to review an analysis of impacts of the approved alternatives and select a preferred alternative at their February 2016 meeting; however, the biological and economic impacts of each alternative have not yet been analyzed in detail. In addition, the APs proposed new alternatives for consideration as part of this framework.

¹ For trawl nets with codends (including an extension) of fewer than 75 meshes, the entire trawl net must have a minimum mesh size of 5.0 inches throughout the net.

Council staff therefore recommend that the Council postpone final action of the GRA Framework until April 2016, by which time Council staff can prepare a more thorough analysis of impacts of the alternatives.

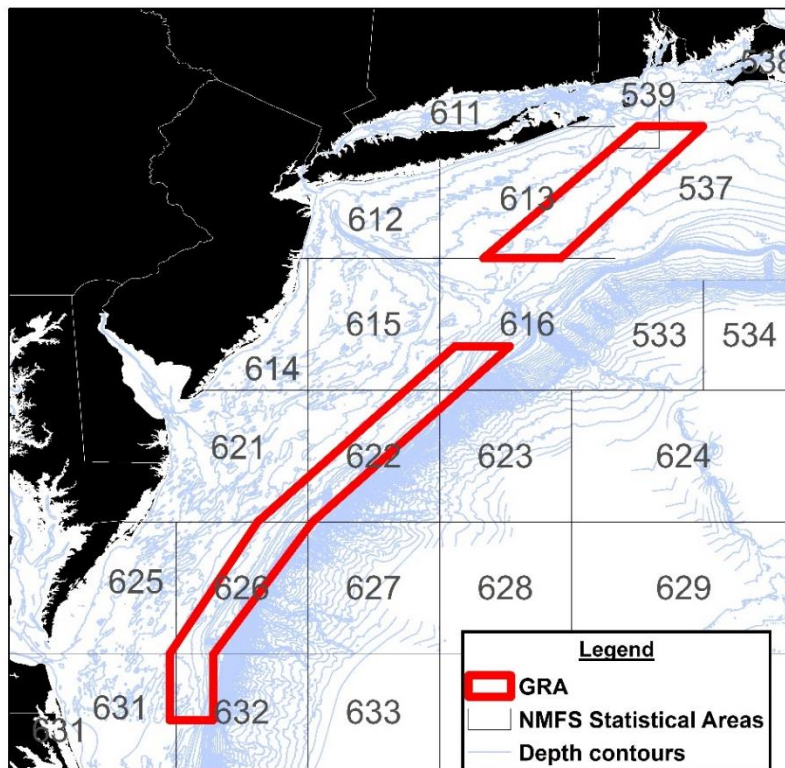


Figure 1: Boundaries of current scup Gear Restricted Areas (GRAs).

Alternatives

The Council approved a range of alternatives for the GRA framework during their December 2015 meeting. These alternative are described below.

Alternative 1: No action/status quo

Alternative 1a: Status quo Northern GRA

Alternative 1a is the *status quo*/no action alternative for the Northern GRA. Under this alternative, the regulations for the Northern GRA would remain unchanged.

Alternative 1b: Status quo Southern GRA

Alternative 1b is the *status quo*/no action alternative for the Southern GRA. Under this alternative, the regulations for the Southern GRA would remain unchanged.

Advisory Panel Input on Alternative 1

Of the sixteen advisors present at the January 2016 AP meeting, only one expressed support for alternative 1 (*status quo*/no action). This advisor said he supported either no changes to

the GRAs or slight modifications to the GRA boundaries to increase access to squid without decreasing the conservation benefits for scup.

Alternative 2: Expand the Northern GRA to include more of statistical area 613

The Council approved a single alternative which would modify the boundaries of the Northern GRA. This alternative would expand the Northern GRA into statistical area 613 and is based on a Northeast Fisheries Science Center (NEFSC) analysis of the scup GRAs (Terceiro and Miller 2014) and 2014 discard information (Mark Terceiro, personal communication). These data show that during 2010-2014, on average, about half of the scup discards in squid and small-mesh² fisheries during the fourth quarter of the year³ in the statistical areas which include the Northern GRA occurred in area 613. During 2009 about 77% of scup discards in small and squid mesh fisheries in Northern GRA statistical areas during the last quarter of the year came from area 613 (Figure 2). However, scup discards in small and squid mesh fisheries in these areas and months were relatively low overall in recent years (e.g. 2010-2014), especially when compared to 1989-1995 (Figure 2).

Figure 3 shows an example of modified Northern GRA boundaries under this alternative. If implemented as shown in Figure 3, this alternative would represent a 63% increase in the size of the Northern GRA, compared to the *status quo* Northern GRA (Table 1).

Advisory Panel Input on Alternative 2

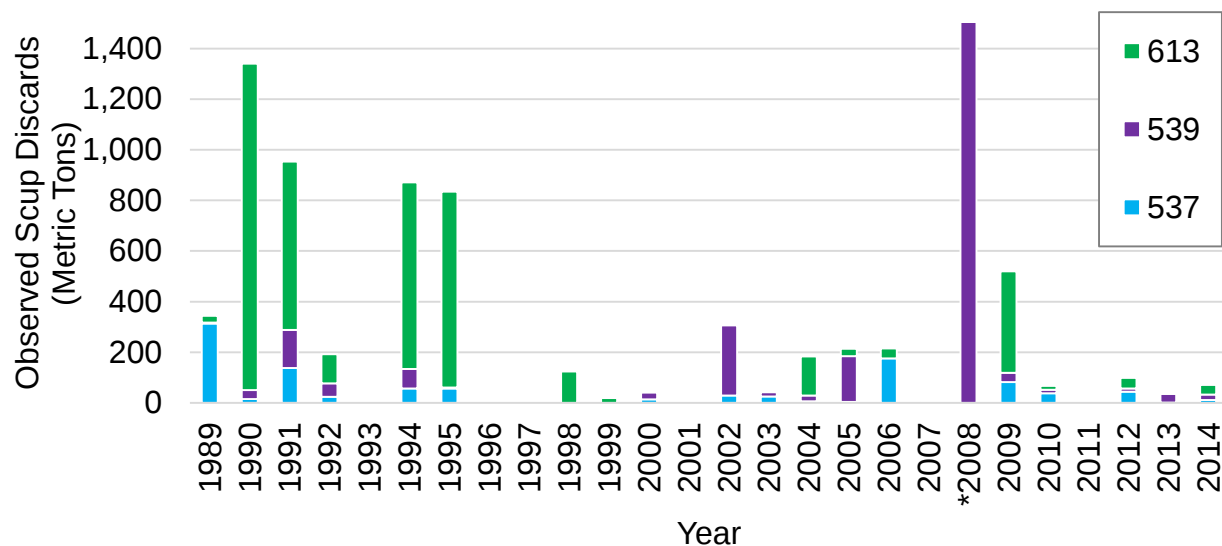
No advisors supported any alternatives which would expand the boundaries of the GRAs, including alternative 2. Advisors agreed that because scup spawning stock biomass is estimated to be at about 210% of the target level (NEFSC 2015), expansion of the GRAs is not necessary and would cause negative economic impacts for fishermen targeting non-exempt species (longfin squid, black sea bass, and silver hake/whiting). Advisors did not propose any new alternatives for the Northern GRA.

Table 1: Approximate size of Northern GRA alternatives.

Alternative	Area (square kilometers)	Area (square nautical miles)	Difference from <i>status quo</i> Northern GRA
1a: <i>Status quo</i> Northern GRA	5,108	1,489	0%
2: Expand Northern GRA into statistical area 613	8,350	2,434	+63%

² The NEFSC analysis of scup discards defines “small mesh” as mesh that is smaller than the minimum mesh required in the directed scup fishery (4.5 inches from 1996 until 2005, and 5.0 inches after 2005) but larger than the mesh that is typically used in the longfin squid fishery. “Squid mesh” is defined as mesh that is smaller than 2.125 inches (Terceiro and Miller 2014).

³ Discard estimates referenced in this document are based on the discard estimation methodology used in the NEFSC white paper on scup discards (Terceiro and Miller 2014) and in the 2015 scup benchmark stock assessment (NEFSC 2015). These discard estimates are aggregated by NMFS statistical area, by mesh size category (squid, small, and large), and by calendar quarter.



*Discards in 2008 totaled 7,417 mt

Figure 2: Observed scup discards in small and squid mesh trips in the Northern GRA statistical areas (statistical areas 537, 539, and 613) during the fourth quarter of the year from 1989 through 2014.

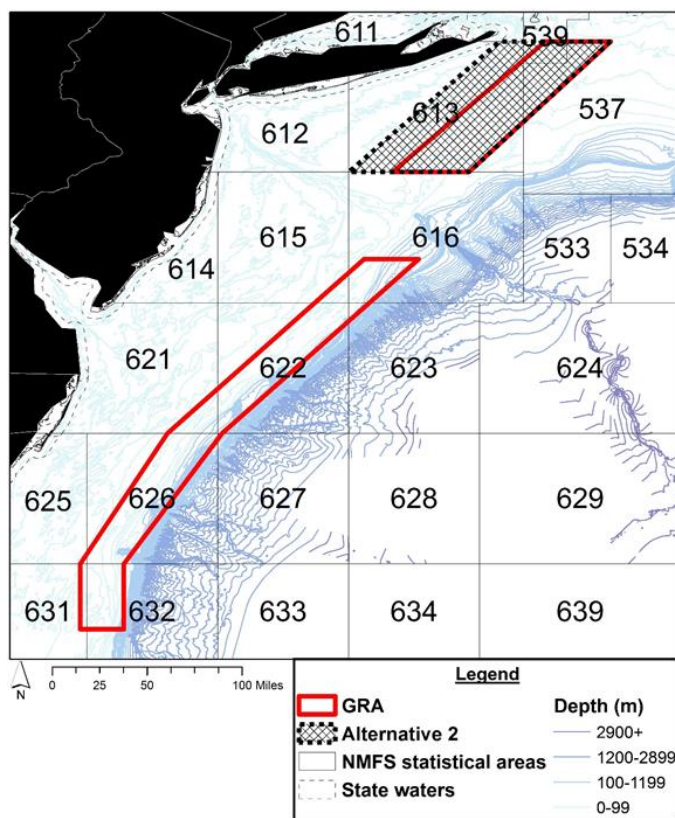


Figure 3: An example of a modification to the boundaries of the Northern GRA to encompass more of statistical area 613 (alternative 2), shown with the current GRA boundaries.

Alternative 3: Modify the area of the Southern GRA

Alternative 3 includes four sub-alternatives approved by the Council to modify the area of the Southern GRA. AP members proposed two additional alternatives to modify the boundaries of the Southern GRA. The Council has not yet approved these two new alternatives for inclusion in the framework, but will consider them during their February 2016 meeting. Under these alternatives, the area of the Southern GRA could decrease by as much as 50% (under an AP proposal) or increase by as much as 28% (under alternative 3d; Table 2). The Council could choose more than one of these alternatives. For example, the Council could select both alternative 3a and alternative 3c, which together would decrease the size of the Southern GRA by 22%.

Table 2: Approximate size of Southern GRA alternatives. The two AP proposals have not yet been approved by the Council for inclusion in the framework.

Alternative	Area (square kilometers)	Area (square nautical miles)	Difference from <i>status quo</i> Southern GRA
1b: <i>Status quo</i> Southern GRA	10,690	3,117	0%
3a: Southern GRA modification proposed by Hank Lackner	9,901	2,887	-7%
3b: Alternative 3a with modification for coral zones	9,837	2,868	-8%
3c: Statistical area 632 removed from Southern GRA	9,039	2,635	-15%
3d: Southern GRA expanded into statistical area 616	13,707	3,996	+28%
AP proposal 1: Statistical areas 632 and 626 removed from the Southern GRA	5,375	1,567	-50%
AP proposal 2: Southern GRA boundary modification drawn at January 2016 AP meeting	6,891	2,009	-36%

Alternative 3a: Modify Southern GRA eastern boundary to align with that proposed by Hank Lackner

Alternative 3a would modify the eastern boundary of the Southern GRA based on a proposal by Hank Lackner, a commercial scup and longfin squid fisherman and a member of both the Council's Mackerel, Squid, and Butterfish AP and the Council's Summer Flounder, Scup, and Black Sea Bass AP. This modification is intended to restore access to certain canyon areas for longfin squid fishing and represents about a 7% decrease in the size of the Southern GRA (Table 2, Figure 4).

Advisory Panel Input on Alternative 3a

Most of the advisors present at the January 2016 AP meeting supported alternative 3a in combination with alternative 3c; however, several of these advisors preferred a new alternative which they proposed at the meeting (shown on page 11).

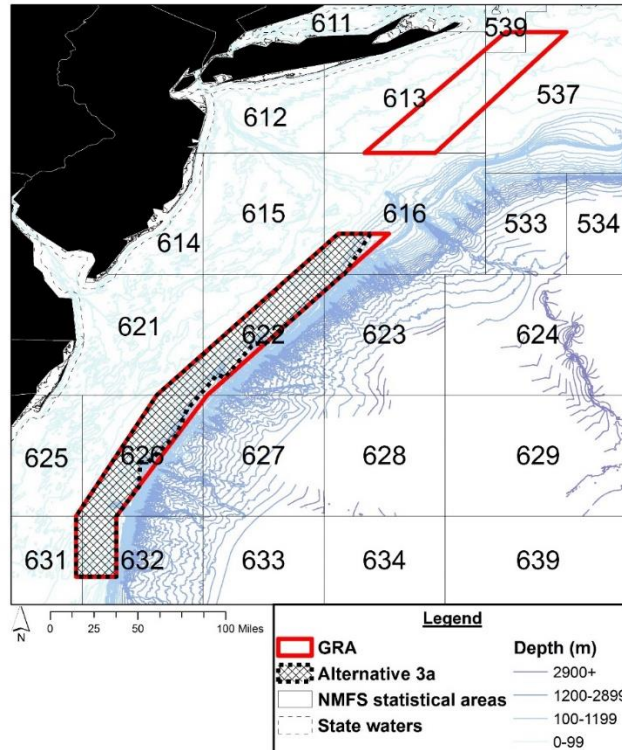


Figure 4: Southern GRA boundary modification proposed by Hank Lackner (alternative 3a), shown with the current scup GRA boundaries.

Alternative 3b: Modify Southern GRA eastern boundary to align with that proposed by Hank Lackner and with modifications for coral zones

Alternative 3b would modify the eastern boundary of the Southern GRA as proposed by Hank Lackner (described in previous section) and would also remove areas of overlap with the deep sea coral discrete and broad zones. All bottom tending gear, including the trawl gear subject to the scup GRA regulations, is prohibited in the coral zones year-round. This modification represents about an 8% decrease in the size of the Southern GRA (Table 2, Figure 5).

Advisory Panel Input on Alternative 3b

Most of the advisors present at the January 2016 AP meeting supported alternative 3b in combination with alternative 3c; however, several advisors preferred a new alternative which they proposed at the meeting (shown on page 11).

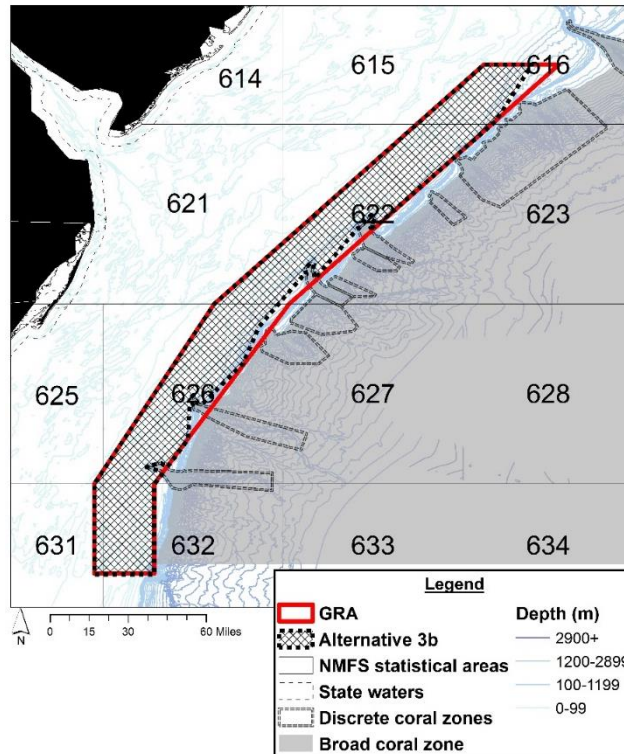


Figure 5: Southern GRA boundary proposed by Hank Lackner with modifications for deep sea coral boundaries (alternative 3b), shown with the current Southern GRA boundaries.

Alternative 3c: Remove statistical area 632 from the Southern GRA

Alternative 3c would remove statistical area 632 from the Southern GRA. Between 1989 and 2013, very small amounts of scup discards have been observed in statistical area 632. Specifically, only 90 pounds of scup discards were observed in statistical area 632 between 1989 and 2013, compared to 406,238 pounds in statistical area 616. Of all the statistical areas included in the scup GRAs, only statistical area 627 had fewer observed discards (40 pounds) than statistical area 632 during 1989-2013 (Terceiro and Miller 2014). It is expected that statistical area 632 could be removed from the Southern GRA with minimal impacts to the scup stock. This alternative would result in a 15% decrease in the size of the Southern GRA (Table 2, Figure 6).

Advisory Panel Input on Alternative 3c

With the exception of one advisor who preferred alternative 4 (eliminate the GRAs), all advisors present at the January 2016 AP meeting supported alternative 3c, especially in combination with alternative 3b.

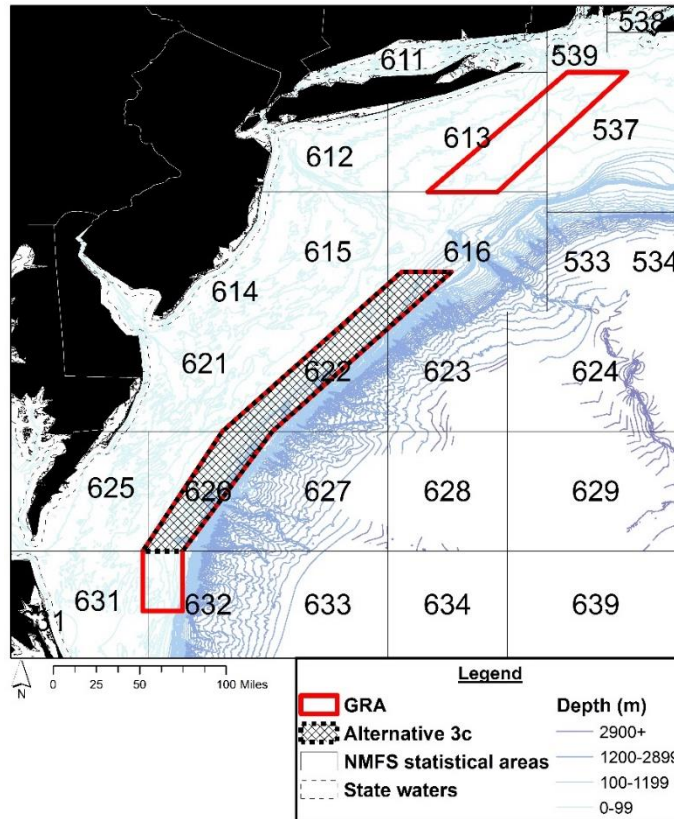


Figure 6: The boundaries of the Southern GRA with statistical area 632 removed (alternative 3c), shown with the current GRA boundaries.

Alternative 3d: Expand the Southern GRA to include more of statistical area 616

Under alternative 3d, the boundaries of the Southern GRA would be modified to include more of statistical area 616. Statistical area 616 accounted for the majority of scup discards within the GRAs from 1989 through 2013. Area 616 continued to have relatively high amounts of scup discards after implementation of the GRAs (Figure 7; Terceiro and Miller 2014).

When the GRAs were first implemented in May 2000, both GRAs were much larger than their current configuration and the Southern GRA included about half of statistical area 616. Several fishing industry members expressed concern that the GRAs would cause severe economic hardships due to their large size. The GRA boundaries were modified shortly after their initial implementation to address this concern. Under this first modification, effective December 2000, both GRAs were greatly reduced in size and a second Northern GRA was added, which mostly fell within statistical area 616. This modification did not sufficiently address the concerns of several fishing industry members. Statistical area 616 includes Hudson Canyon, a productive fishing area for many species. When the GRAs were modified a second time, effective March 2001, much of statistical area 616 was removed from the GRAs to allow small mesh fisheries to access Hudson Canyon (66 *Federal Register* 12902, March 1, 2001).

Figure 8 shows an example of how the Southern GRA could be expanded into statistical area 616 under this alternative. The boundaries shown in Figure 8 are based on the boundaries of the second Northern GRA as implemented in December 2000. The Southern GRA boundaries shown in Figure 8 represent a 28% increase in the size of the Southern GRA.

Advisory Panel Input on Alternative 3d

No advisors have expressed support for increasing the size of the GRAs. A few advisors said that alternative 3d would have especially severe negative economic impacts because it would close Hudson Canyon, a productive fishing area, to small mesh fisheries for over three months each year.

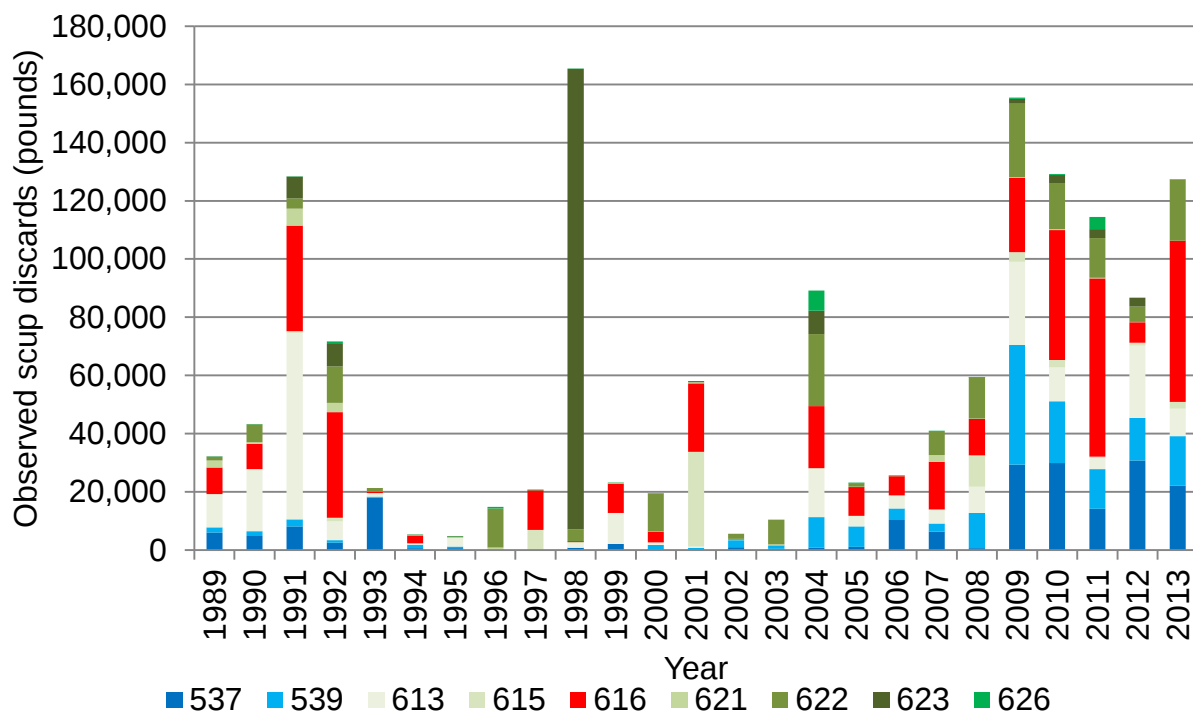


Figure 7: Observed scup discards in statistical areas within the GRAs with time series totals greater than 10,000 pounds (from Terceiro and Miller 2014). Northern GRA statistical areas are shown in shades of blue. Southern GRA statistical areas are shown in shades of green, with the exception of statistical area 616, which is shown in red to highlight that area's relatively high contribution to scup discards in the GRA areas in recent years. Over 90% of scup discards in 1998 came from a single tow in area 623 which discarded an estimated 150,000 pounds of scup.

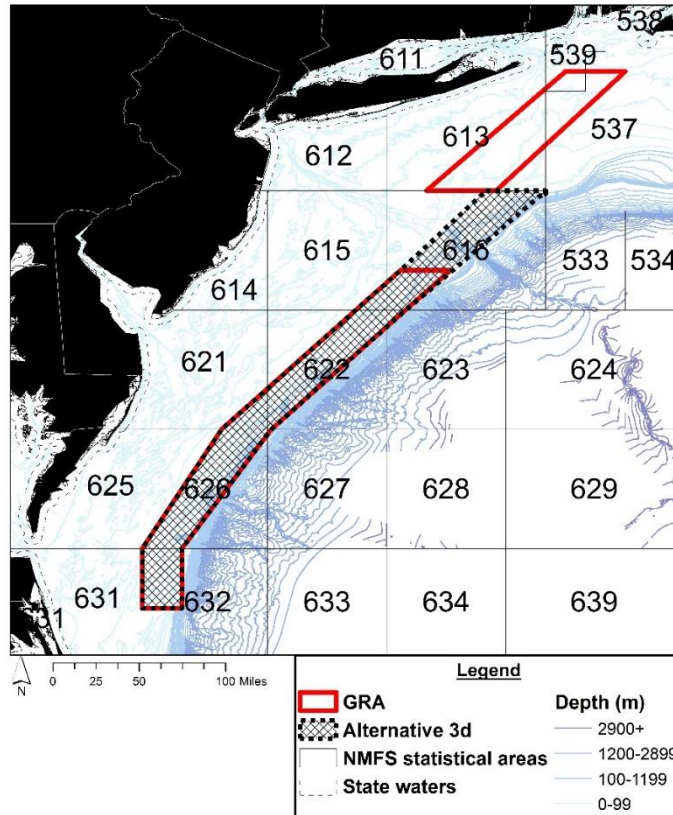


Figure 8: The boundaries of the Southern GRA expanded into statistical area 616 (alternative 3d) shown with the current GRA boundaries.

Additional Southern GRA Alternatives Proposed by Advisors

Several advisors present at the January 2016 AP meeting developed a new proposal for a Southern GRA boundary, shown in Figure 9. Like alternatives 3a and 3b, this proposal is intended to restore access to important fishing areas for longfin squid. This proposal excludes statistical area 632 from the Southern GRA; however, the advisors who drew the new boundary said they would ideally also like statistical area 626 to be removed (Figure 10). The AP proposal as shown in Figure 9 represents a 36% decrease in the size of the Southern GRA. If statistical area 626 were also removed, this alternative would represent a 61% decrease in the size of the Southern GRA.

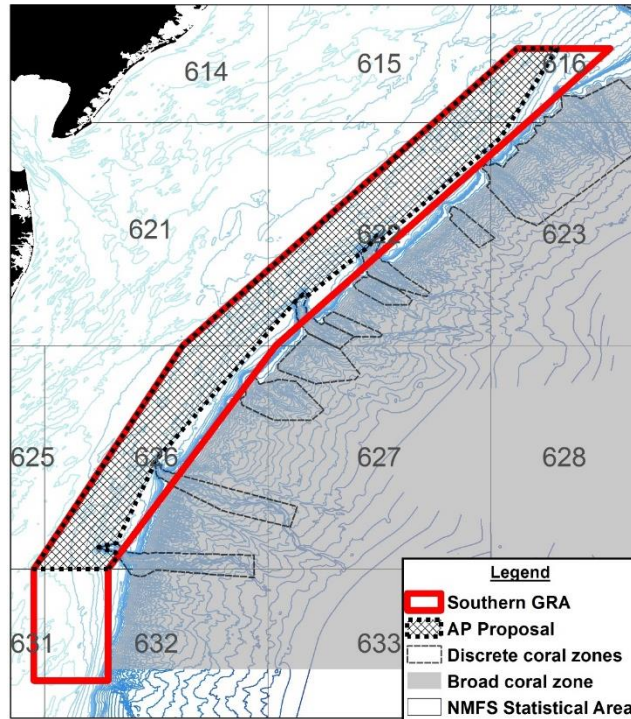


Figure 9: Proposal for modified Southern GRA boundaries developed by advisors at the January 2016 AP meeting.

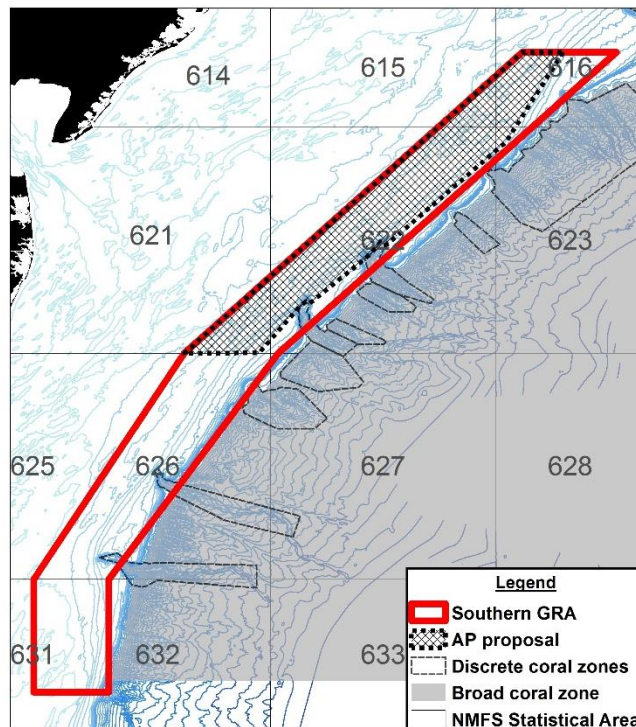


Figure 10: Proposal for modified Southern GRA boundaries developed by advisors at the January 2016 AP meeting. These advisors preferred that statistical area 626 be removed from the Southern GRA, as shown in this figure; however, if the Council did not favor this alternative, the advisors supported the proposal shown in Figure 9.

Alternative 4: Eliminate the Scup GRAs

Alternative 4a: Eliminate the Northern GRA

Under alternative 4a, the Northern GRA would be eliminated from the regulations.

As shown in Figure 2, scup discards in small and squid mesh tows in the Northern GRA statistical areas have generally decreased since implementation of the GRAs in 2000 (with a few exceptions, such as 2008). The NEFSC GRA analysis concludes that “the GRAs have likely reduced the discard mortality of small scup, and are responsible for the improved post-recruitment survival of these small scup” (Terceiro and Miller 2014). If the GRAs were eliminated, discard mortality of small scup could increase and scup spawning stock biomass could be negatively impacted.

Alternative 4b: Eliminate the Southern GRA

Under alternative 4b, the Southern GRA would be eliminated from the regulations. As described above, the NEFSC analysis suggests the GRAs have had important conservation benefits for scup and likely played a role in rebuilding the scup stock (Terceiro and Miller 2014). Negative impacts to the scup population could result from elimination of the GRAs; however, positive economic impacts for small-mesh fisheries could also occur. Several advisors stressed that the Southern GRA in particular has had severe negative economic impacts for longfin squid fishermen.

Advisory Panel Input on Alternatives 4a and 4b

A few advisors recommended that the scup GRAs be eliminated, or at least temporarily suspended. Four advisors supported a recommendation to suspend the GRAs for one or two years, which they argued would not only provide economic benefits to fishermen targeting non-exempt species such as longfin squid, but would also allow for the collection of data on scup discards. Small mesh fisheries for non-exempt species have been prohibited from fishing in the GRA areas during the effective times of the year since 2000, which poses challenges for predicting changes in scup discards if those areas were to be partially or completely opened to small mesh fisheries. If the GRAs were temporarily suspended, some advisors argue, the Council could better predict the impacts to the scup stock if the GRAs were eliminated or reduced in size.

Alternatives to Modify the Timing of the GRAs

At their December 2015 meeting the Council decided not to include alternatives to modify the effective dates of the GRAs as part of this framework. Council staff presented an analysis which suggested that changes to the GRA dates would likely not substantially improve the effectiveness of the GRAs. Additionally, at that time the Council had not received any comments from advisors suggesting that the GRA dates should be modified. However, at the January 2016 AP meeting, a few advisors recommended that the Council consider an alternative which would change the effective dates of the Southern GRA from January 1 - March 15 to February 1 - March 15. These advisors said the distribution of scup has changed over time and scup are no longer prevalent in the Southern GRA in January.

Exempted Fishing Permits

Council staff recommend that the Council consider the use of Exempted Fishing Permits (EFPs) to allow fishermen using small mesh to fish within the GRAs. EFPs could be used to collect data which could be used to assess the impacts of eliminating the GRAs or reducing their size. The Council could allow EFPs in conjunction with alternatives 1, 2, or 3. Because there is an existing process for obtaining EFPs, the Council does not need to add a management alternative for EFPs to this framework. The APs did not discuss EFPs at their January 2016 meeting.

NMFS implemented a scup GRA exemption program in 2003 (68 *Federal Register* 60, January 2, 2003) but discontinued the program in 2005 because no vessels participated (70 *Federal Register* 303, January 4, 2005). To participate in this exemption program, vessels were required to carry an exemption program authorization, to pay for and carry a NMFS-certified observer on board if any portion of the trip occurred in a GRA, and to fish in the GRA only with a net modified to include an escapement extension with at least 45 meshes of 5.5-inch square mesh positioned behind the body of the net and in front of the codend.

References

NEFSC (Northeast Fisheries Science Center). 2015. 60th Northeast Regional Stock Assessment Workshop (60th SAW) Assessment Report. *Northeast Fisheries Science Center Reference Document* 15-08; 870 p. Available at: <http://www.nefsc.noaa.gov/saw/reports.html>

Tercerio, M. and A. Miller. 2014. Commercial fishery scup discarding and the Gear Restricted Areas (GRAs). Unpublished working paper from the NEFSC Population Dynamics Branch. Available in briefing materials at: <http://www.mafmc.org/briefing/december-2015>



**Summer Flounder, Scup, Black Sea Bass
and Mackerel, Squid, Butter Fish
Advisory Panel Meeting
January 20, 2016
Meeting Summary**

Meeting Summary

The Council's Summer Flounder, Scup, and Black Sea Bass (SFSBSB) and Mackerel, Squid, and Butterfish (MSB) Advisory Panels (APs) met to discuss the Council's framework action to modify the scup Gear Restricted Areas (GRAs) on Wednesday January 20, 2016 in Long Branch, New Jersey, with some members participating via webinar. Council staff presented an analysis of GRAs performed by the Northeast Fisheries Science Center (NEFSC). The APs considered and discussed the range of management alternatives approved by the Council for the GRA framework. The APs developed recommendations to the Council on these alternatives, including recommendations for three new alternatives. AP recommendations and comments are summarized below.

AP members in attendance: Katie Almeida (MSB), Lars Axelsson (MSB), Jim Beirnes (SFSBSB), Bonnie Brady (SFSBSB), James Fletcher (SFSBSB), Jeff Gutman (SFSBSB), Emerson Hasbrouck (MSB), Greg Hueth (SFSBSB), Peter Kaizer (MSB), Hank Lackner (SFSBSB, MSB), Jim Lovgren (MSB), Brady Lybarger (SFSBSB), Peter Moore (MSB), Mike Plaia (SFSBSB), Chris Roebuck (MSB), Robert Ruhle (SFSBSB, MSB)

Others in attendance: Julia Beaty (Council staff), Kiley Dancy (Council staff), Howard King (Council member, MSB Committee chair), Jeff Kaelin (Council member), Stephen Axelsson, Carly Bari, Gregory DiDomenico, Peter Hughes, Meghan Lapp, Michael Loper, Liz Scheimer

Summary of AP Comments:

GRA Analysis

Some advisors thought the analyses presented at the meeting had limited utility for informing the management alternatives because, for the most part, scup discards from small mesh tows were not separated from tows using the minimum mesh size for the directed scup fishery. All advisors present in-person recommended that the NEFSC update their GRA analysis with 2014 and 2015 data, with small mesh scup discards separated from large mesh discards, and with consideration of the reported reason for the discards. Some advisors thought the analysis should consider the impacts of other regulatory changes over the past twenty years which may have also contributed to changes in scup discards.

Expansion of the GRAs

None of the advisors present supported an expansion of either GRA. Specifically, no advisors supported alternative 2 (expand the Northern GRA into statistical area 613) or alternative 3d (expand the Southern

GRA into statistical area 616). Several advisors stated that alternative 3d would have severe negative economic impacts for the squid fishery.

One advisor said that scup discards are unavoidable and fishermen should not be penalized for discarding scup, especially considering that the scup stock is rebuilt to more than double the target biomass. One advisor commented that, with a rebuilt stock like scup, there is no reason to consider any alternatives which would have negative economic impacts (e.g. alternatives to expand the boundaries of the GRAs).

Elimination of the GRAs

One advisor said the GRAs should not be expanded or eliminated. He did not want more scup to be exposed to commercial capture, but supported options to slightly modify the GRA boundaries to provide more fishing opportunities to squid fishermen.

Two advisors wished to see the Southern GRA eliminated. One advisor recommended that the Council suspend enforcement of both GRAs for one or two years. The Council could then assess the resultant changes in scup discards and then consider re-instating the GRAs if necessary. This advisor suggested that the Council decide whether or not to “turn on” the GRAs in any given year during the specifications process. He suggested that the decision be based on the biomass of scup, such that if spawning stock biomass falls below a predetermined level, recommended by the SSC or an FMAT, then the Council would “turn on” the GRAs. He said the GRAs are a rebuilding tool, and now that scup has been successfully rebuilt the tool should be put aside until needed again. Three other advisors supported this recommendation.

Two advisors commented that the Southern GRA has caused millions of dollars of lost revenue for squid vessels. One advisor said scup discards were problematic in the past but have been adequately addressed by other regulations, such as minimum mesh requirements and the minimum fish size in the directed scup fishery.

Reduction of size of GRAs

One advisor said that because there are many conservative buffers built into the quota-setting process, exposing more scup to capture in the squid fishery would probably not threaten the scup population.

All advisors present at the meeting supported alternative 3c, which would remove statistical area 632 from the Southern GRA. According to the NEFSC analysis, very few scup discards have come from this area over the past two decades. Some advisors said the distribution of scup has shifted and scup are no longer as prevalent in the southern-most areas of the Southern GRA, compared to when the GRAs were first implemented in 2000.

Two advisors wished to add an alternative which would remove both statistical area 632 and 626 from the Southern GRA. Another advisor said he supported this alternative, but only if adding it to the framework would not prevent any changes from being implemented by January 1, 2017.

With the exception of one individual, all advisors at the meeting supported a combination of alternative 3b (the initial proposal put forward by Hank Lackner with modifications for the deep sea coral protection zones) and alternative 3c (removal of statistical area 632 from the Southern GRA). The one advisor who disagreed said he preferred to temporarily suspend enforcement of the GRAs.

Several advisors proposed a new alternative for the Southern GRA boundaries, which they drew on a nautical chart at the meeting. The proposal is shown in Figure 1. The advisors who participated via webinar were not able to see this drawing during the meeting. All advisors present in-person supported the addition of this alternative and expressed a desire that it be combined with alternative 3c (remove statistical area 632 from the Southern GRA), and with a new alternative to remove statistical area 626. A few advisors re-iterated that their support of removing statistical area 626 was conditional on the addition of this alternative not preventing implementation of the framework by January 1, 2017.

Timing of GRAs

One advisor suggested that the Council add an alternative to consider changing the effective dates of the Southern GRA from January 1 – March 15 to February 1 – March 15. He said the distribution of scup has changed over time and scup are no longer prevalent in the Southern GRA in January. One advisor said he would support this alternative only if the addition did not prevent the framework from being implemented by January 17, 2017. No other advisors voiced opposition to this suggestion.

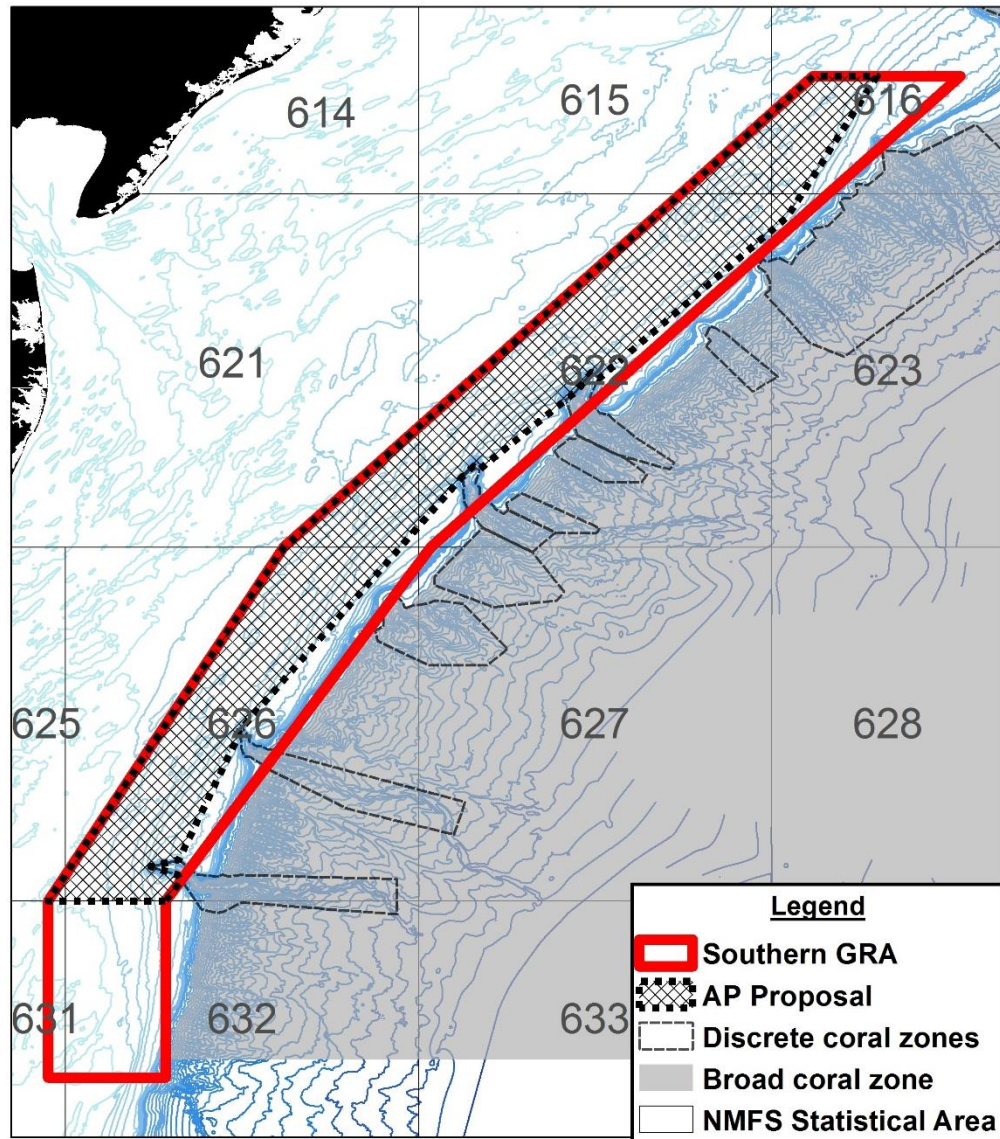


Figure 1: Proposal for modified Southern GRA boundaries developed by advisors at the January 2016 AP meeting. Advisors present noted that they would ideally like statistical area 626 to also be removed from the Southern GRA.

**Commercial fishery scup discarding and
the Gear Restricted Areas (GRAs)
by
Mark Terceiro and Alicia Miller
NEFSC Population Dynamics Branch**

Executive Summary: The NEFSC Observer data show that since 1989 most of the observed commercial fishery scup discards occurred in small mesh tows in the Statistical Areas that include the GRAs. SBRM estimates of scup discards have been reduced in the GRA areas and months since 2001. Relatively high scup discards have occurred recently (2009-2010) outside the GRA areas and months. The NEFSC Fishery Observer, Dealer, Vessel and Trawl Survey data, and the stock size and mortality estimates that result once this information is integrated within the stock assessment, indicate that the GRAs have likely reduce the discard mortality of small scup, and are responsible for the improved post-recruitment survival of these small scup.

Introduction

Broad scale Gear Restricted Areas (GRAs) for scup were implemented in November 2000 under the framework provisions of the FMP to reduce discards of scup in the small mesh fisheries for *Loligo* squid and silver hake. Initially two Northern Areas off Long Island were implemented for November through January, while a Southern Area off the mid-Atlantic coast was implemented for January through April. The size, boundaries, and other measures of the GRAs were modified in late 2000 and again in 2001 and 2005 in response to commercial fishing industry recommendations. Currently the single Northern GRA restricts the use of codend mesh less than 5.0 inches (127 mm) during November and December, while a Southern GRA is in effect from January 1 through March 15.

Observer Data

The Northern and Southern GRAs lie mainly in NEFSC statistical reporting areas (statistical areas) 537, 539, and 613 (Northern GRA) and 615, 616, 621, 622, 623, 626, and 632 (Southern GRA; Figure 1). Over the 1989-2013 (preliminary) time series, very little scup discard was observed in statistical area 632. Statistical areas 611 and 538, which are not included in the GRAs, also were the source of 'significant' discards (cumulative total observed scup discards > 10,000 lbs; Figure 2). The other nine statistical areas that include the GRAs accounted for 1.474 million (84%) of the 1.767 million lbs of cumulative total observed scup discards from January 1989 through December 2013 (Figure 3). It should be noted that about 80% of the cumulative total observed scup discards in area 623 occurred in a single tow (~150,000 lbs) in 1998 (Figure 3).

Both the observed discards (as a function of both increased fishing activity for scup and increased sampled trip number) and estimated fishery discards (as a function of increased fishery quotas and therefore increased fishing activity for scup) have generally increased as the fishery quotas have increased since 2005 (Figure 4), although the observed discard percentage of total catch has decreased (Figures 5-6). Scup commercial fishery estimated discards remain an important component of the commercial fishery removals and averaged about 25% of the

estimated commercial catch during 2010-2012 (100% commercial fishery discard mortality is assumed).

Within the nine important GRA statistical areas that account for 84% of observed scup discards over the 1989-2013 time series, 24% was observed in 'large' mesh tows (codend or liner < 4.5 [114 mm] or 5.0 in [127 mm], 35% in 'small' mesh tows (larger than 2.125 in [54 mm] and smaller than 4.5 or 5.0 inch), and 41% in 'squid' mesh tows (equal to or less than 2.125 inch; Figure 7). The distribution of observed discards varies by statistical area, season, and mesh size. In the northern GRA statistical areas (537, 539, 613) 'large' mesh discards were observed mainly in November and December, although large mesh discards also occur in January and May in area 613 (Figure 8). Northern GRA area 'small' mesh discards were observed mainly in November and December in area 613 (Figure 9). Northern GRA area 'squid' mesh discards were observed mainly in May and June in areas 537 and 539 and in November and December in area 613 (Figure 10). In the important southern GRA statistical areas (615, 616, 621, 622, 623, 626), 'large', 'small' and 'squid' mesh discards were observed mainly in January through April (Figures 11-13).

The NEFSC Observer data show that since 1989 most of the observed scup discards occurred in small mesh tows in the Statistical Areas that include the GRAs. In the winter-spring (February-April in NEFSC survey data; January-March in Observer data) during the pre-GRA years of 1998-2000, most scup were distributed within the eventual Southern GRA (Figure 14). Observer data indicated scup discards both within the eventual Southern GRA and northward into the eventual Northern GRA. During 2010-2012, scup continued to be distributed within the Southern GRA. Observer data continued to indicate scup discards both within and along the northeastern boundaries of the Southern GRA and northward along the 50 fathom depth contour into the Northern GRA (Figure 15).

In the fall (September-October in NEFSC survey data; November-December in Observer data) during the pre-GRA years of 1998-2000, survey data indicated that nearly all scup were distributed well inshore of the eventual Northern GRA (Figure 16). Observer data from 1-2 months later in the year, however, indicated scup discards both within the eventual Southern GRA and northward along the border of the eventual Northern GRA. During 2010-2012, scup continued to be distributed inshore of the GRAs at the time of the fall survey. Observer data continued to indicate scup discards within the Southern GRA and northward along the 50 fathom depth contour into and around the Northern GRA (Figure 17).

Observed discard length frequencies for both the pre-GRA years of 1998-2000 and the most recent years of 2010-2012 within the important Northern and Southern GRA Areas indicate the observed discards at length consist of sublegal fish (less than 9 inches total length <= 8 inches fork length <= 20 cm fork length; Figures 18-19). NEFSC survey length data indicated that during 1998-2000 most of the fish sampled from offshore Long Island and to the south in the winter, spring and fall were fish <= 20 cm fork length (ages 1 and 2 in the spring, ages 0 and 1 in the fall; Figures 20-22). During 2010-2012, increased numbers of fish > 20 cm fork length were evident in waters north of Hudson Canyon (Figures 23-24). In the winter and spring surveys, scup were distributed mostly within the Southern GRA. Fish sampled in the fall survey during September-October were nearly all still outside the Northern GRA, but as noted earlier, the Observer data indicate that by November significant amounts of scup were discarded within the Northern GRA.

Current Assessment Discard Estimates

The NEFSC Fishery Observer Program has collected information on landings and discards in the commercial fishery since 1989. The method currently used in the scup stock assessment uses geometric mean scup discards to scup landings (GMDL) ratios for trips catching scup to estimate discards. The ratios of discards to landings are stratified by landings level (for trip landings < 300 kg (661 lbs), the ‘bycatch fishery’; or $\geq$ 300 kg, the ‘directed fishery’) and half-year, and then multiplied by corresponding observed scup landings from the NEFSC Dealer Report database to provide estimates of scup discards. Geometric mean rates (re-transformed, uncorrected, mean ln-transformed Discards to Landings per trip) are used because the distributions of landings, discards and the ratio of discards to landings on a per-trip basis in the scup fishery are highly variable and positively skewed. Observed trips with both scup landings and discard were used to calculate per trip discard to landings ratios. Only trips with both non-zero scup landings could be used for this approach to avoid division by zero, which limits the amount of data that can be used in the estimation.

Of particular note is an extremely large 1998 ‘directed fishery’ ratio and subsequent very high annual discard estimate (111,973 mt) based on the previously noted single trawl gear trip, with 93% of the discard from that trip attributable to a single tow in which an estimated 68 mt (~150,000 lbs.) of scup were captured. This tow was not lifted from the water and the captain of the vessel estimated the weight of the catch. There has been debate concerning the validity of the catch weight estimate and whether or not it was representative of other vessels or trips in the fishery. However, the observation was reported by a trained NEFSC observer and was therefore included in the initial calculation of the estimate of scup discards. Peer reviews of the scup assessment have since concluded that the 1998 estimate (173,690 mt) is infeasible, and it has been replaced by the mean of the 1997 and 1999 estimates (3,331 mt; Figure 4). Despite the uncertainty of the discard data, recent peer review panels (e.g, NEFSC 2008) have concluded that commercial discarding of scup has been high during most of the last twenty years, generally approaching or exceeding the commercial landings. Since the full implementation of the GRAs in 2001, estimated discards have averaged 35%-40% of the total commercial catch.

Estimated discards using the Standardized Bycatch Reporting Method (SBRM)

For this work, alternative estimates of scup discards using the SBRM were developed to ensure adequate sample size and better precision in developing fine temporal and spatial scale estimates of scup discards with which to evaluate to effect of the GRAs on the magnitude and pattern of discarding. SBRM estimates of scup discards (the ratio of trip scup discards to trip all species landings, raised by all species landings) were made by calendar quarter (4), stat area (20), and three mesh categories (large, small, squid). This provided 240 annual estimation strata, compared to the 4 strata used in the current assessment discard method (2 half years, directed trips, non-directed trips). Data were not sufficient to develop SBRM monthly estimates (i.e., too many of the 720 annual strata with no data).

This SBRM approach indicates that scup discards decreased from about 3,300 mt in 1991 to about 500 mt in 2000, with most discards (59%) occurring in areas that would eventually be in the GRAs (615, 616, 621, 622, 625, 626 in quarter 1; 537, 539, 613 in quarter 4). Discards have ranged between 500 and 1,500 mt since 2001, with the exception of 2009 and 2010 (3,200 and 2,600 mt, respectively). Since 2001, 53% of the discards have occurred outside the GRAs. The large discards in 2009-2010 were due mostly to squid mesh discards outside the GRAs: in squid mesh trips in the Northern GRA areas but in quarter 2.

The total scup discards and percent of discards in the GRAs is shown in Figure 25. Discard components in the Northern and Southern GRAs compared to discards in all other stat areas and quarters are shown in Figure 26, presented in a 100% stacked histogram. The SBRM indicates that estimated scup discards have been reduced in the GRA areas and months since 2001. Relatively high scup discards have occurred recently (2009-2010) outside the GRA areas and months.

Summary

The NEFSC Fishery Observer, Dealer, Vessel and Trawl Survey data, and the stock size and mortality estimates that result once this information is integrated within the stock assessment, indicate that the GRAs have likely reduce the discard mortality of small scup, and are responsible for the improved post-recruitment survival of these small scup.

Figure 1. NEFSC Statistical Reporting Areas and Scup Gear Restricted Areas (GRAs).

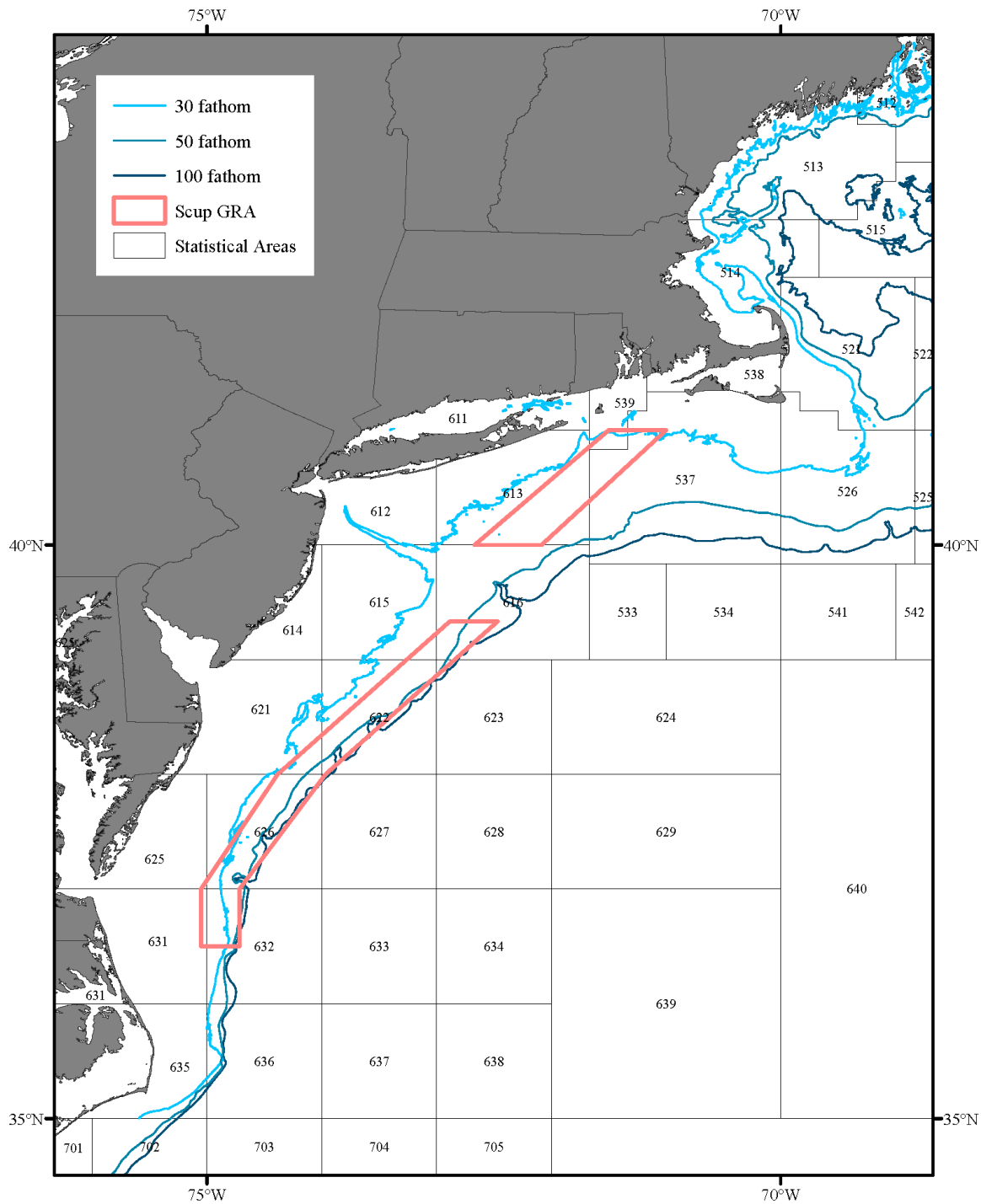


Figure 2. Observed scup discards (lbs) by NEFSC Statistical Area.

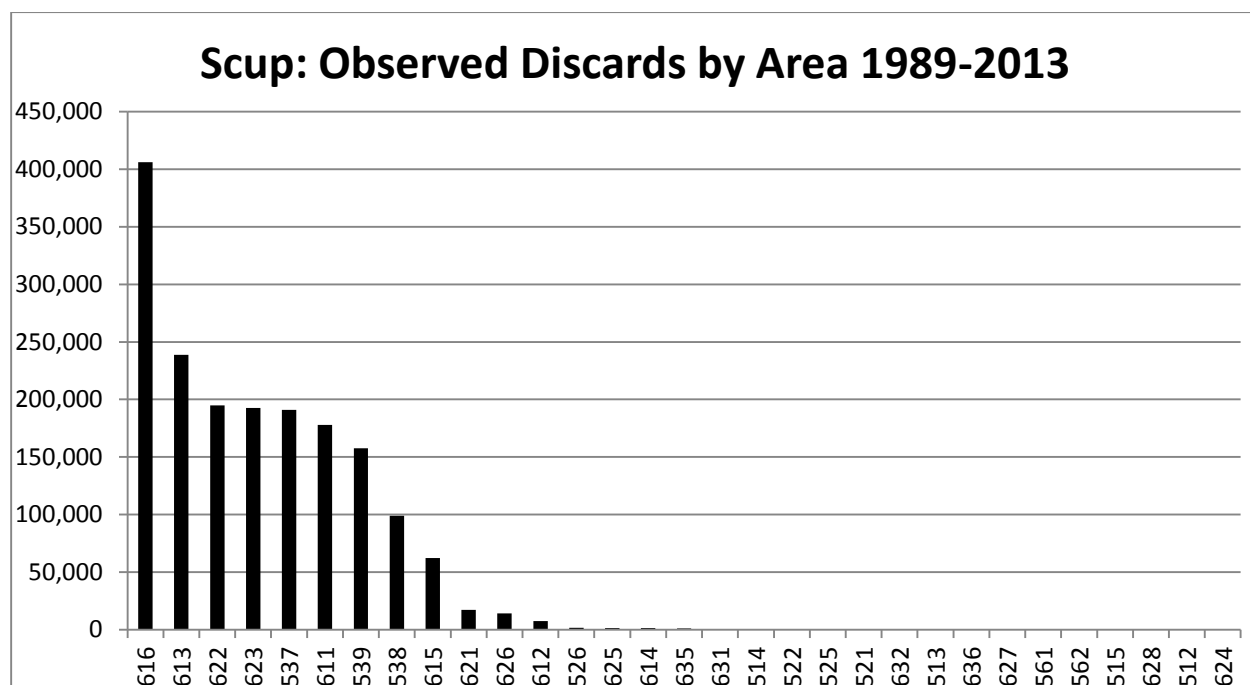


Figure 3. Observed scup discards (lbs) for statistical areas within the GRAs with time series total greater than 10,000 lbs.

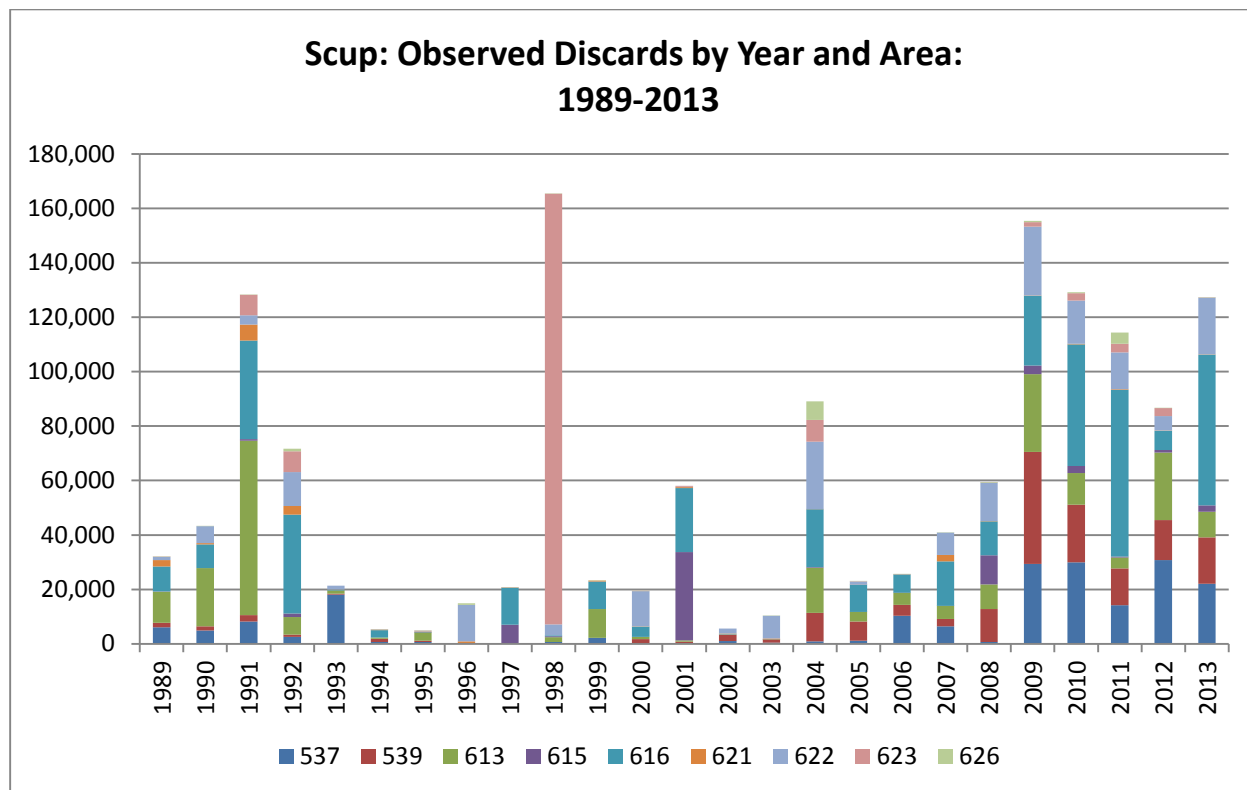


Figure 4. Estimated (metric tons) and Observed (lbs) scup discard trends.

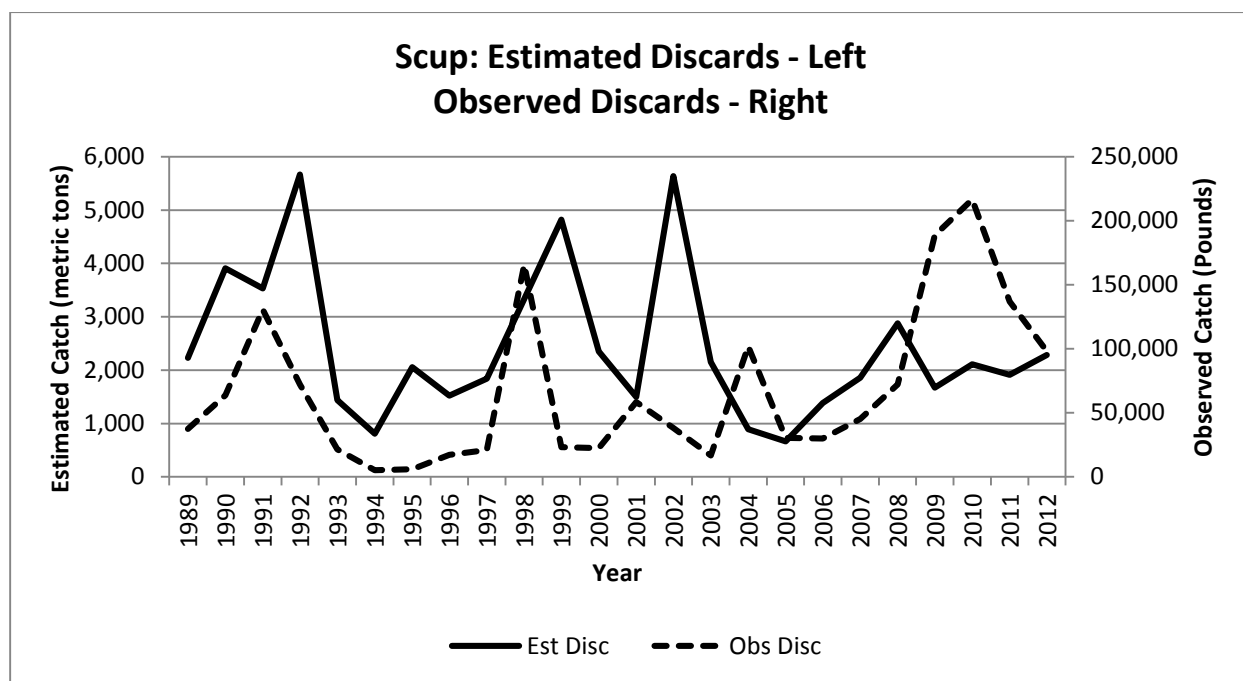


Figure 5. Observed Kept (blue; KLB; Landings) and Discard (red; DLB).

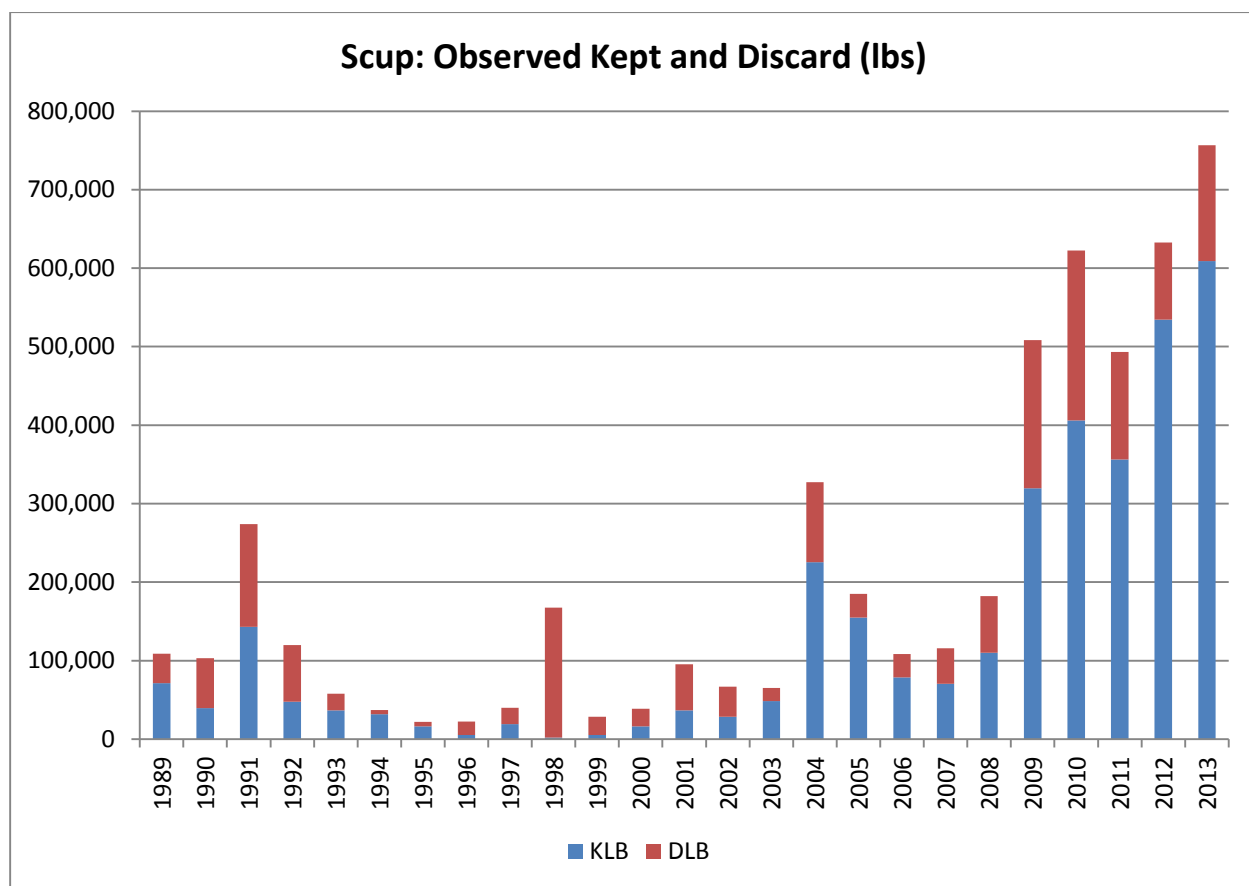


Figure 6. Observed Discard Percentage of Total Scup Catch.

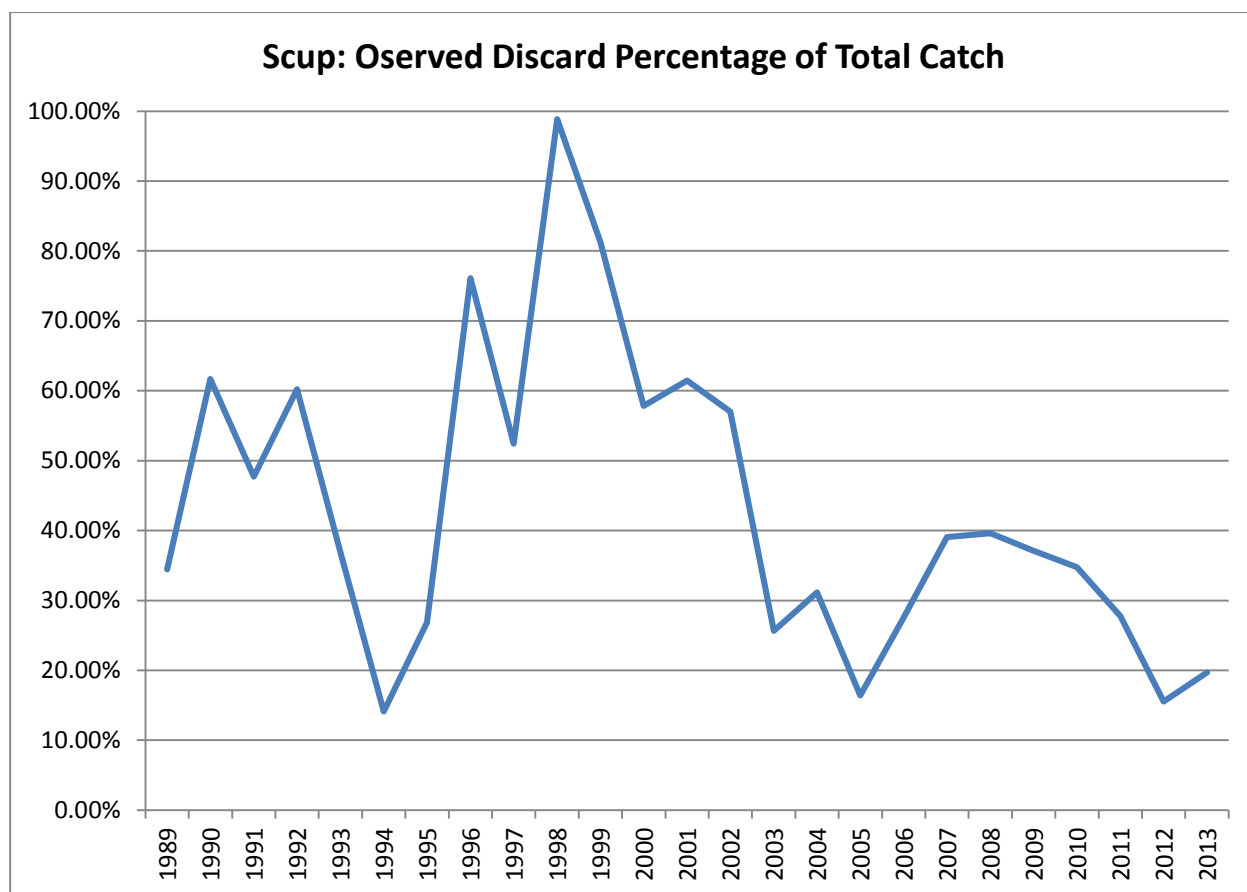


Figure 7. Observed scup discards by statistical area and codend/liner mesh categories. ‘Large’ is equal to or larger than 4.5 or 5.0 inch, depending on year; ‘small’ is between 2.125 and 4.5 or 5.0 inch; ‘squid’ is equal or smaller than 2.125 inch.

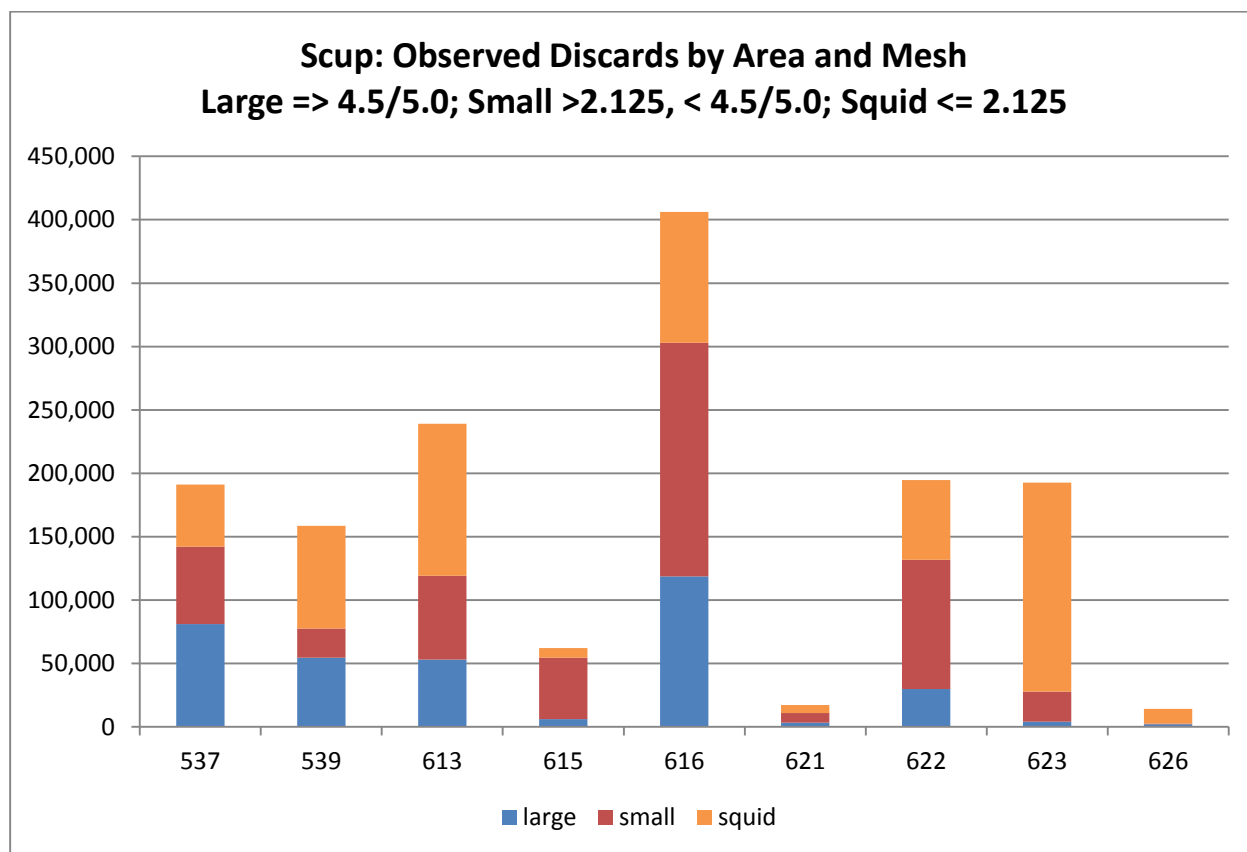


Figure 8. Northern GRA statistical areas 'large' mesh (equal to or larger than 4.5 or 5.0 inch, depending on year) Observed discards by month (Jan = 1, Dec = 12).

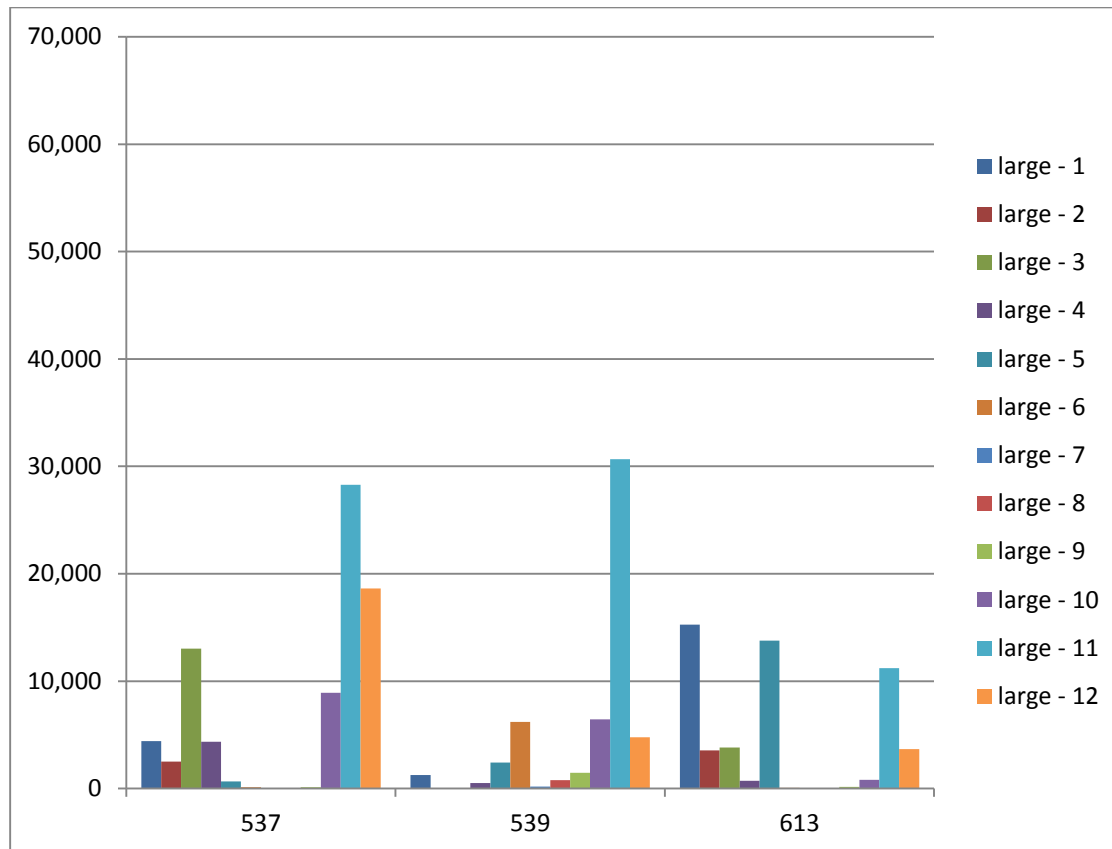


Figure 9. Northern GRA statistical area ‘small’ mesh (between 2.125 and 4.5 or 5.0 inch)
Observed discards by month (Jan = 1, Dec = 12).

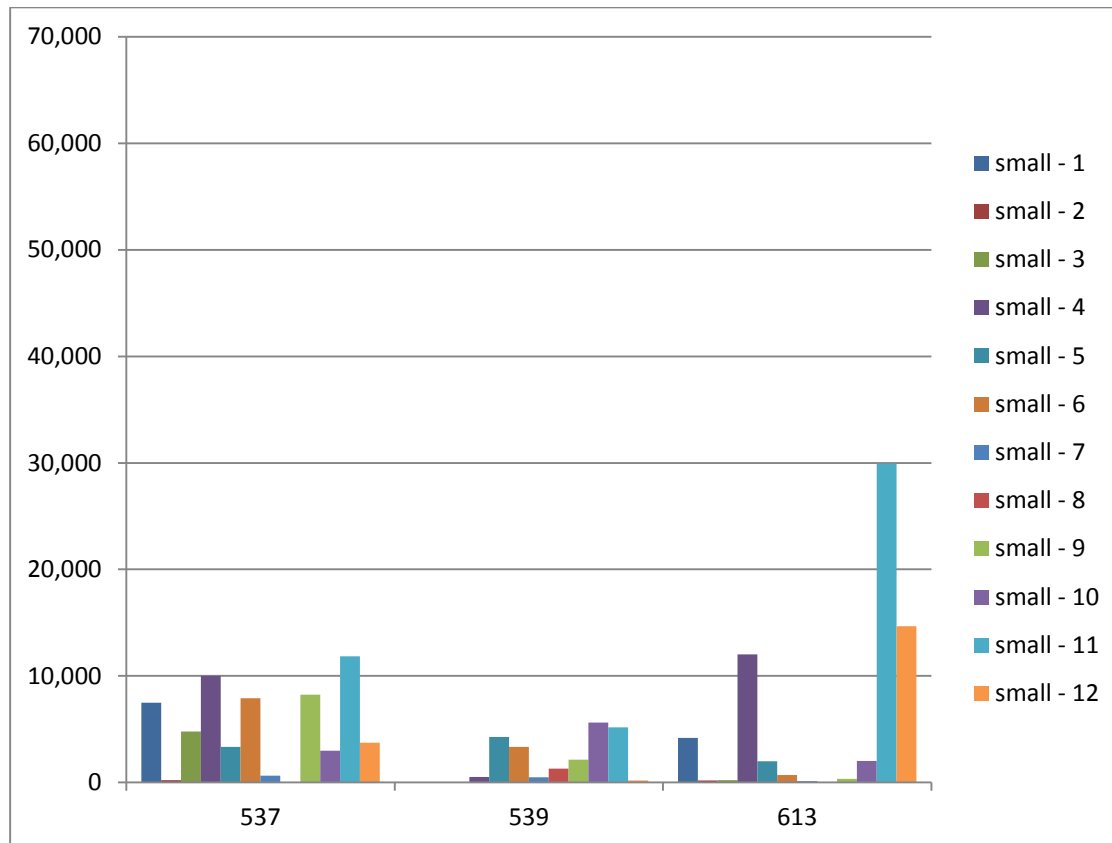


Figure 10. Northern GRA statistical area ‘squid’ mesh (equal to or smaller than 2.125 inch)
Observed discards by month (Jan = 1, Dec = 12).

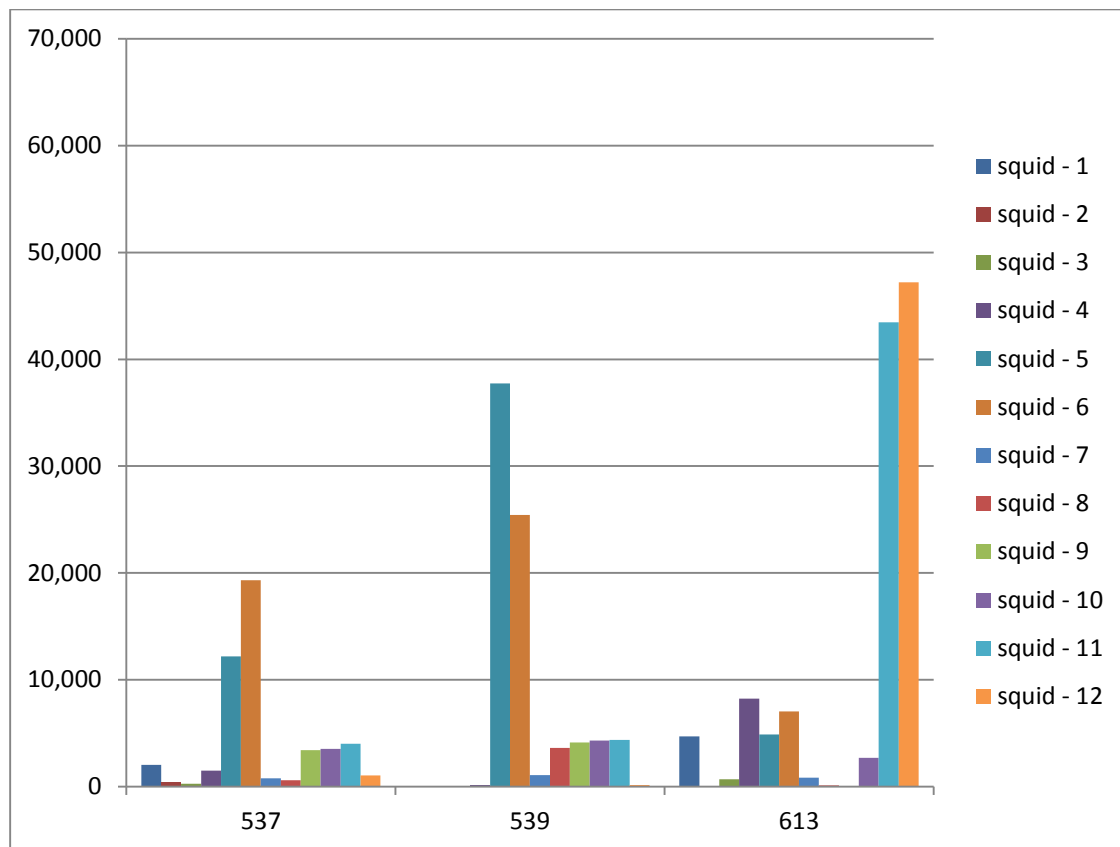


Figure 11. Southern GRA statistical areas 'large' mesh (equal to or larger than 4.5 or 5.0 inch, depending on year) Observed discards by month (Jan = 1, Dec = 12).

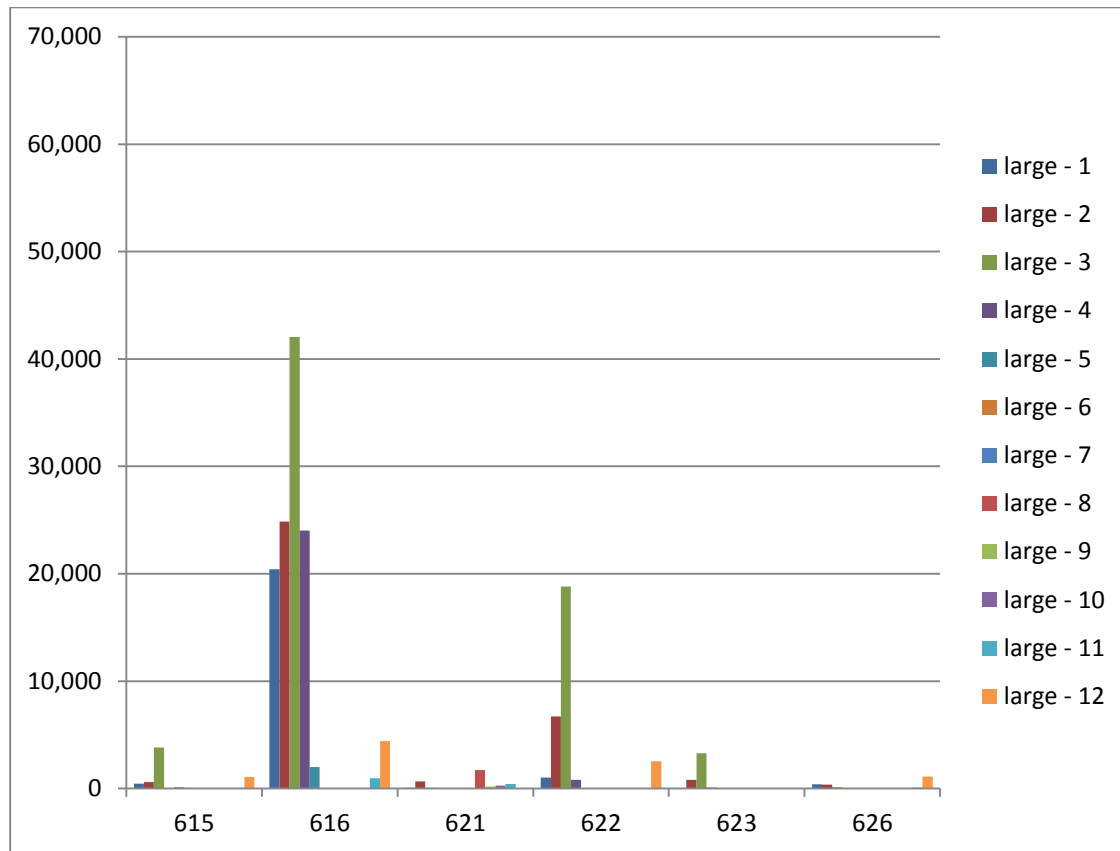


Figure 12. Southern GRA statistical area ‘small’ mesh (between 2.125 and 4.5 or 5.0 inch)
Observed discards by month (Jan = 1, Dec = 12).

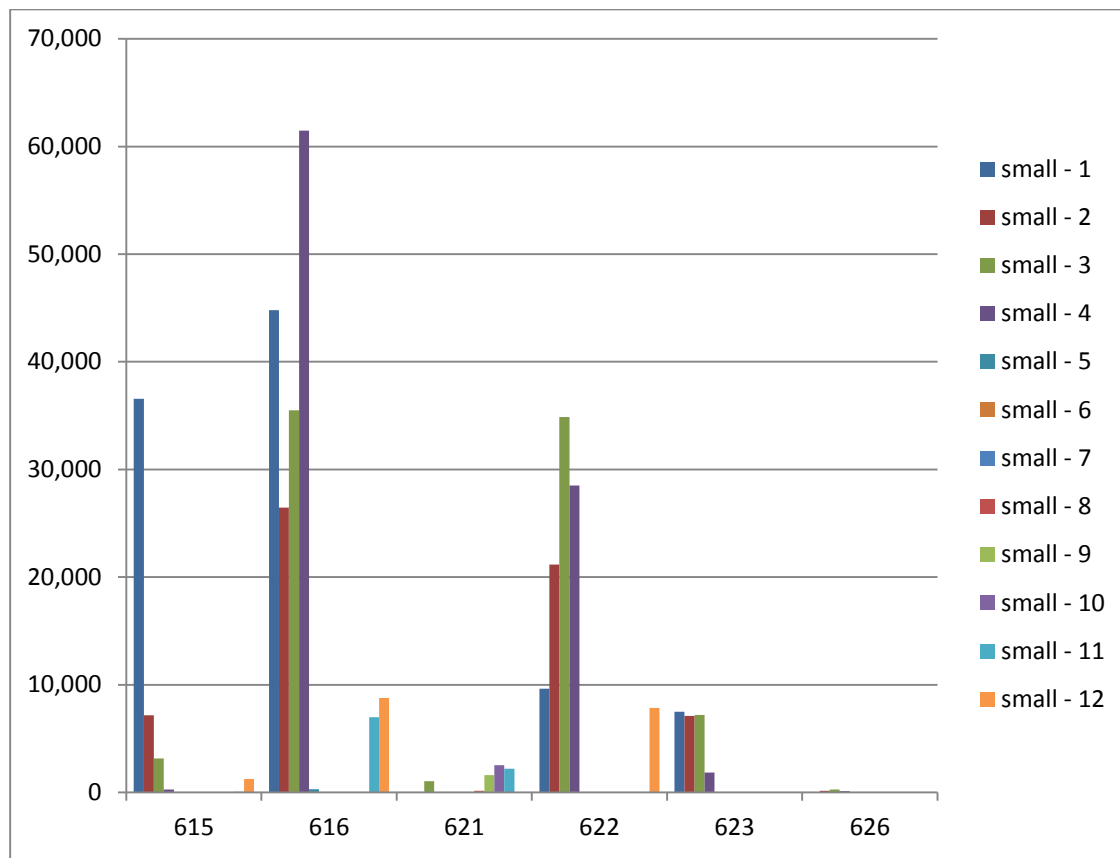


Figure 13. Southern GRA statistical area ‘squid’ mesh (equal to or smaller than 2.125 inch)
 Observed discards by month (Jan = 1, Dec = 12). The large bar in area 623 in March is a single
 tow discard event in 1998 that was observed to be an estimated 150,000 lbs.

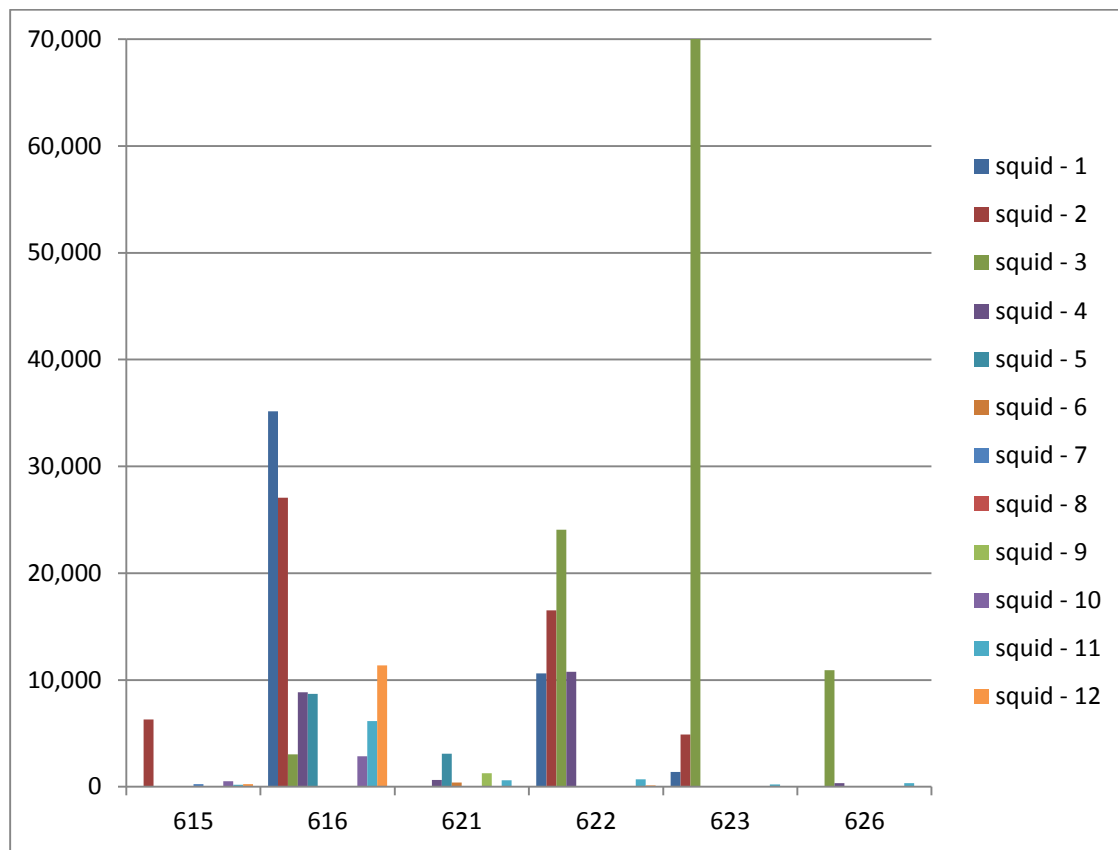


Figure 14. NEFSC winter and spring trawl survey catches of scup (kg/tow; February-March) and Observed scup aggregate discard (metric tons; January-March) during 1998-2000. Gear Restricted Areas (GRAs) outlined in red; depth contours in gray are 50 and 100 fathoms.

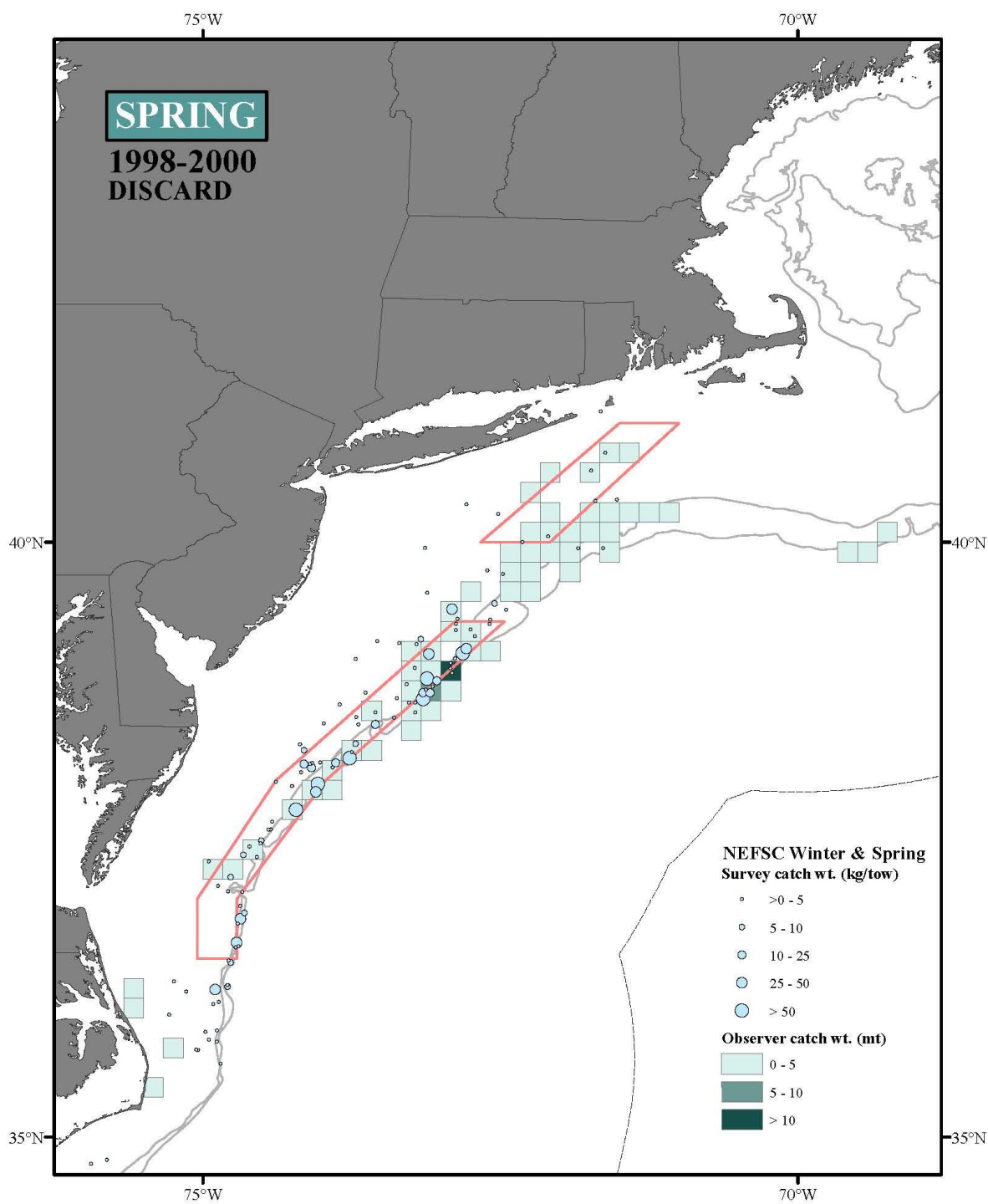


Figure 15. NEFSC winter and spring trawl survey catches of scup (kg/tow; February-March) and Observed scup aggregate discard (metric tons; January-March) during 2010-2012. Gear Restricted Areas (GRAs) outlined in red; depth contours in gray are 50 and 100 fathoms.

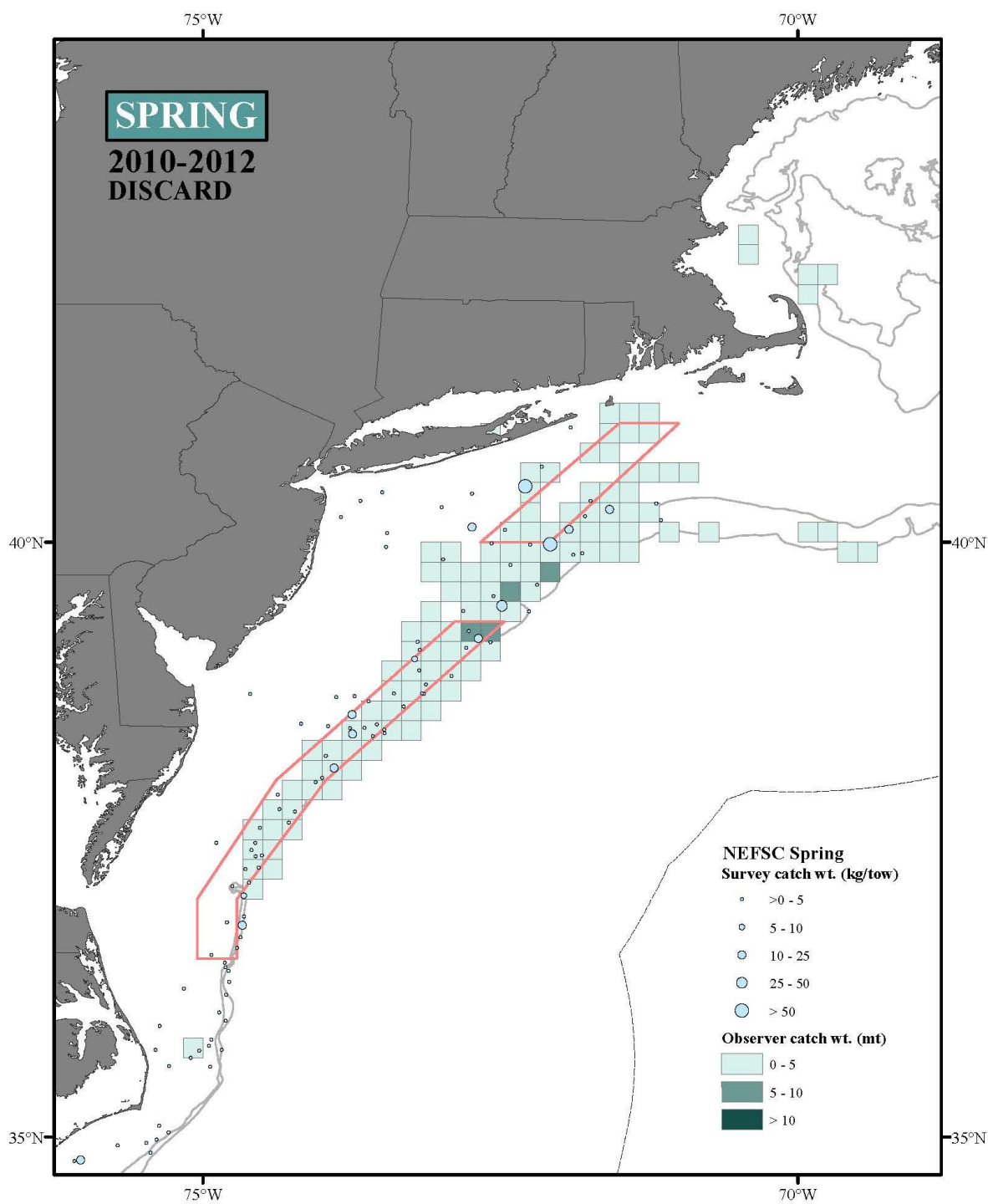


Figure 16. NEFSC fall trawl survey catches of scup (kg/tow; September-October) and Observed scup aggregate discard (metric tons; November-December) during 1998-2000. Gear Restricted Areas (GRAs) outlined in red; depth contours in gray are 50 and 100 fathoms.

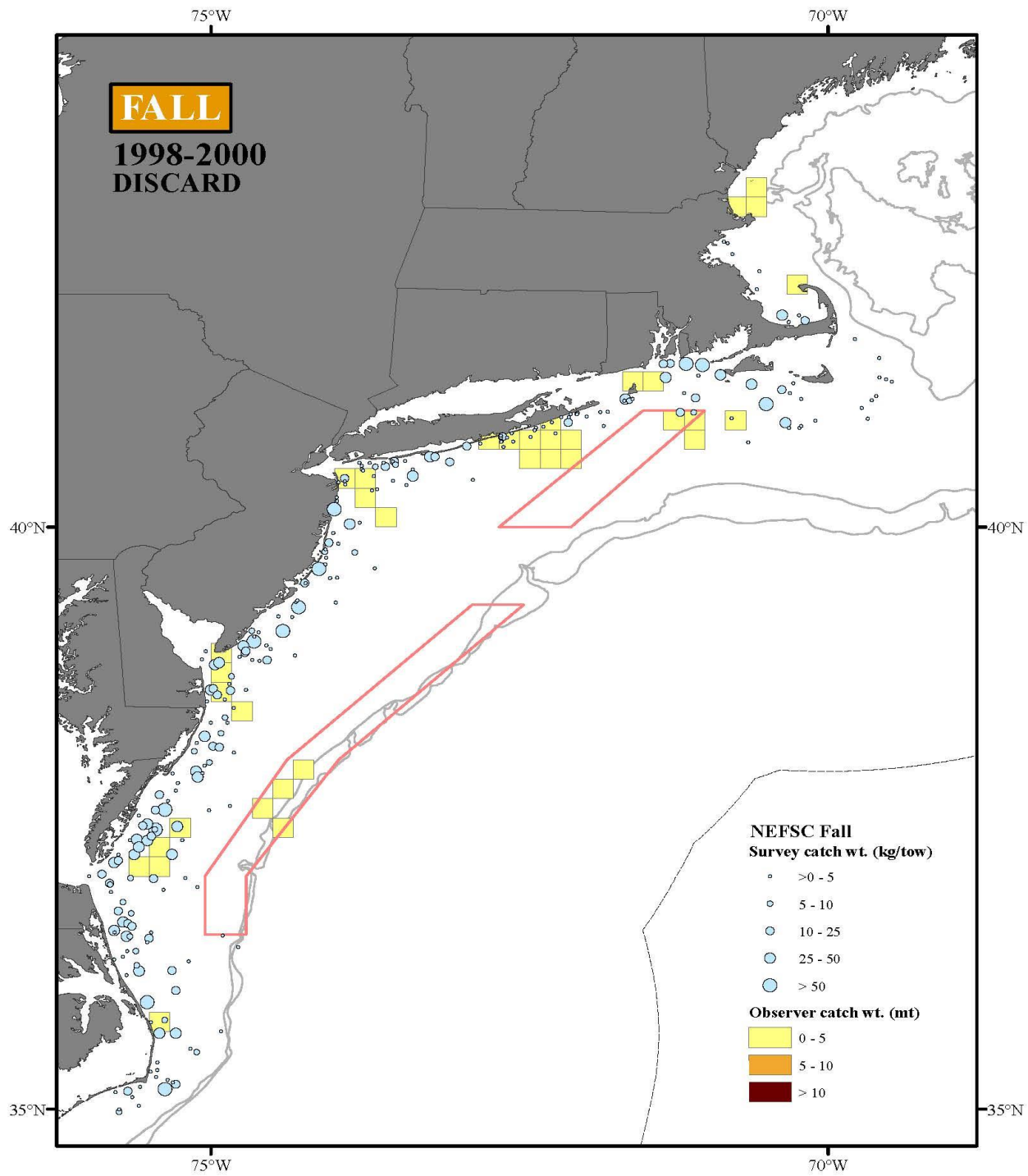


Figure 17. NEFSC fall trawl survey catches of scup (kg/tow; September-October) and Observed scup aggregate discard (metric tons; November-December) during 2010-2012. Gear Restricted Areas (GRAs) outlined in red; depth contours in gray are 50 and 100 fathoms.

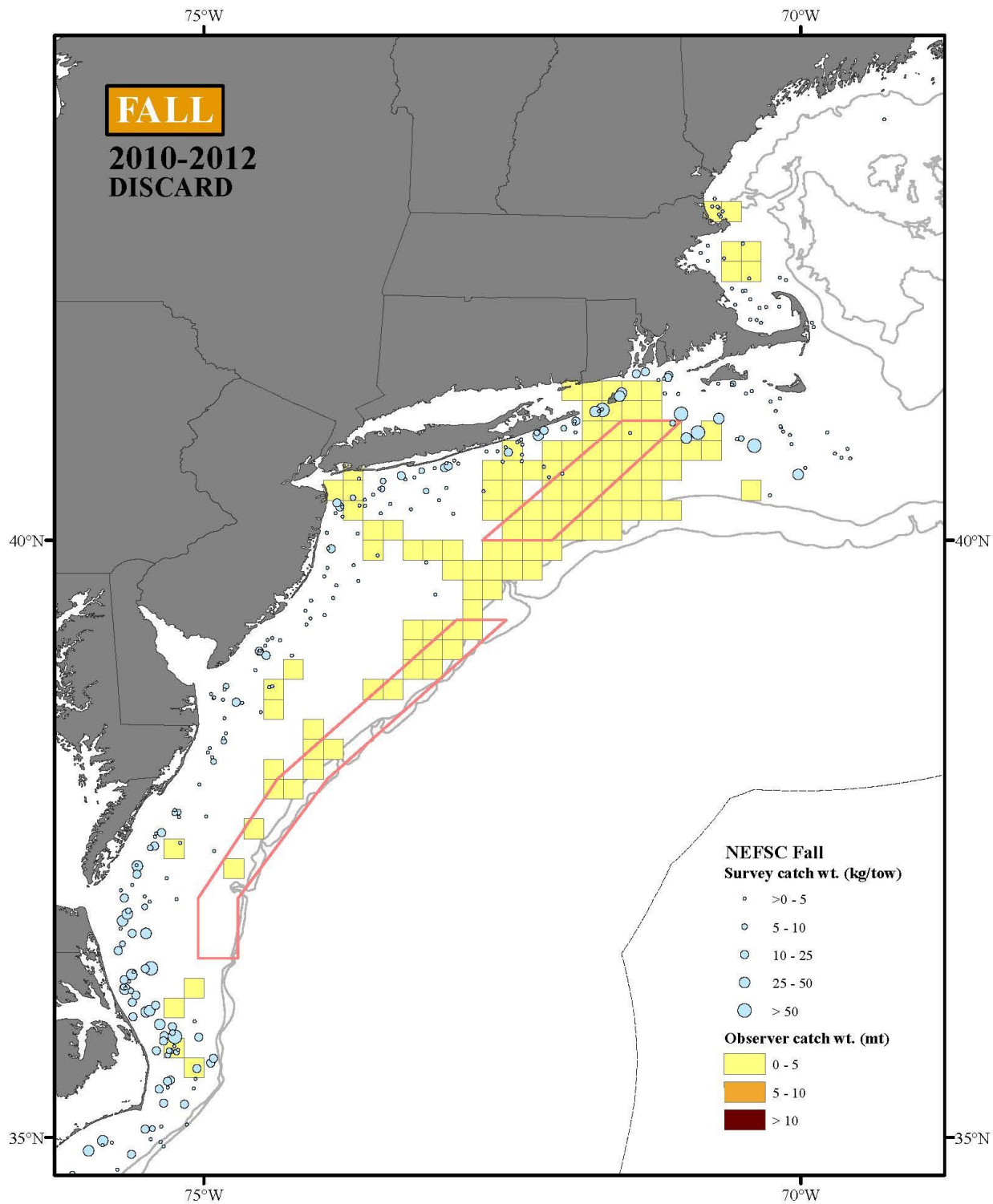


Figure 18. Observed scup discard lengths (cm fork length) in Northern GRA statistical areas during November-December: top 1998-2000, bottom 2010-2012.

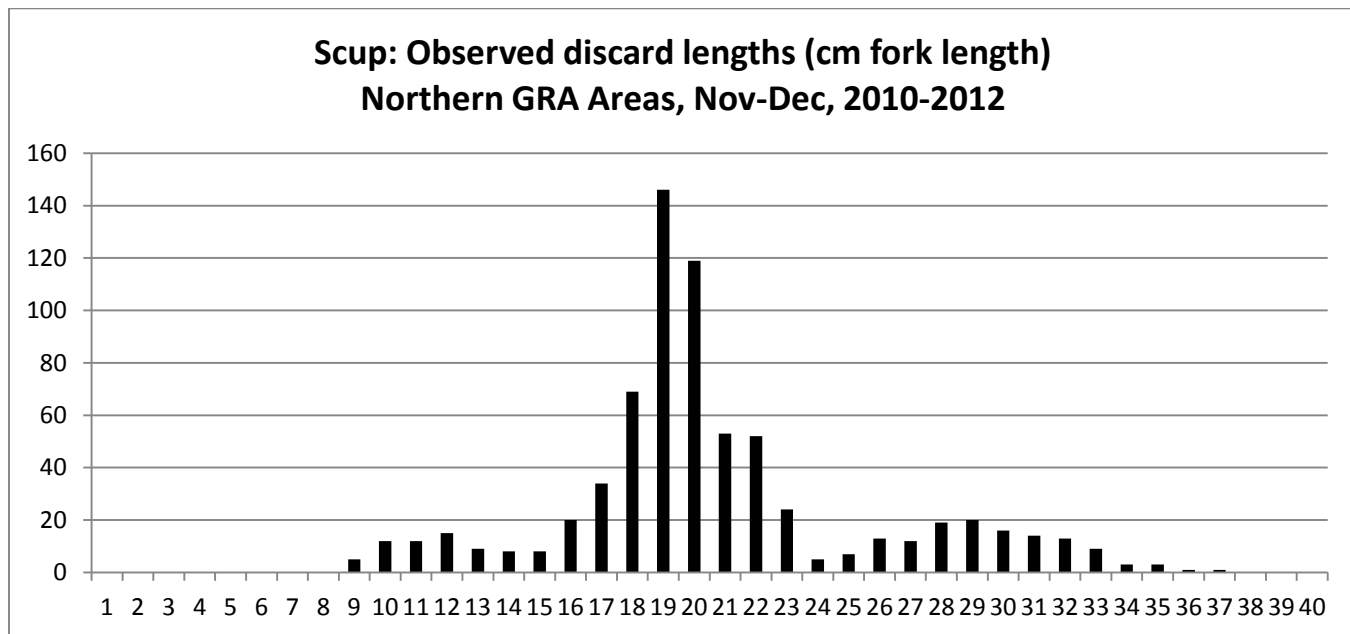
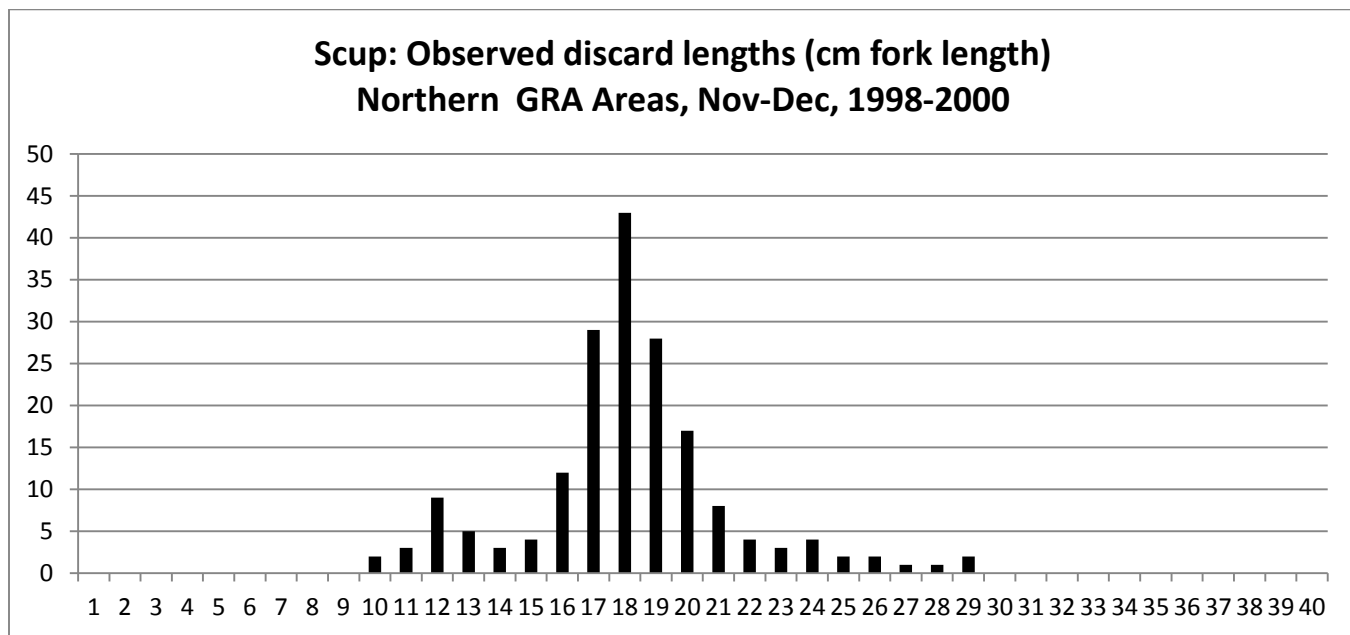


Figure 19. Observed scup discard lengths (cm fork length) in Southern GRA statistical areas during January-March: top 1998-2000, bottom 2010-2012.

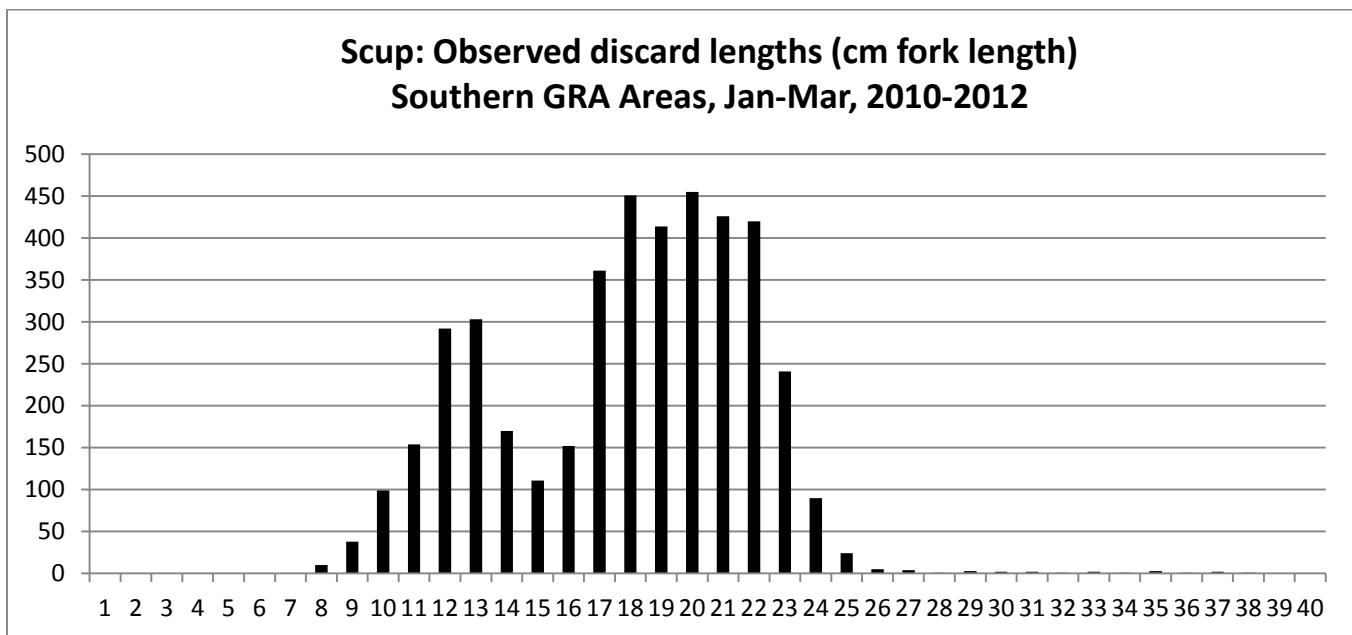
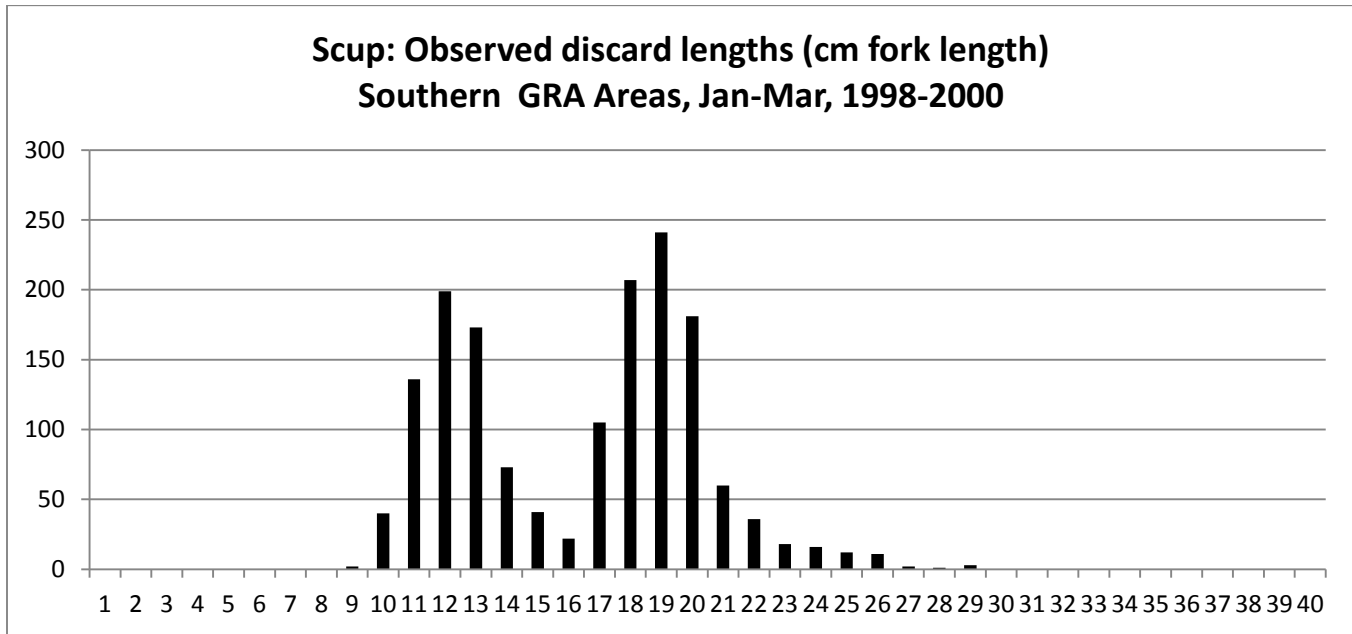


Figure 20. Size distributions of scup in NEFSC winter surveys 1998-2000. Yellow parts of the circles are fish ≤ 20 cm fork length and ages 0 and 1 fish; green slices are fish > 20 cm fork length and ages 2 and older. Size of the circle is proportional to stock size in numbers.

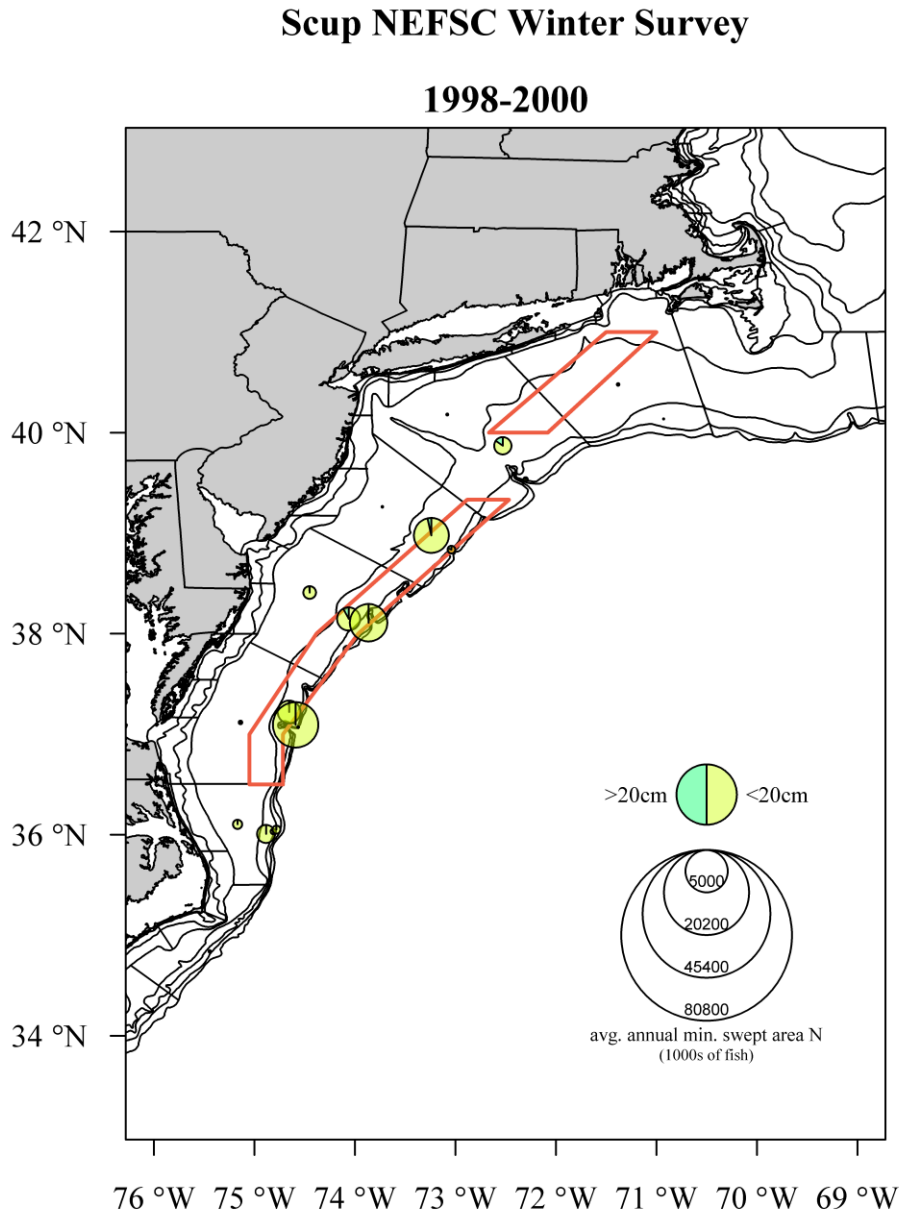


Figure 21. Size distributions of scup in NEFSC spring surveys 1998-2000. Yellow parts of the circles are fish ≤ 20 cm fork length and ages 0 and 1 fish; green slices are fish > 20 cm fork length and ages 2 and older. Size of the circle is proportional to stock size in numbers.

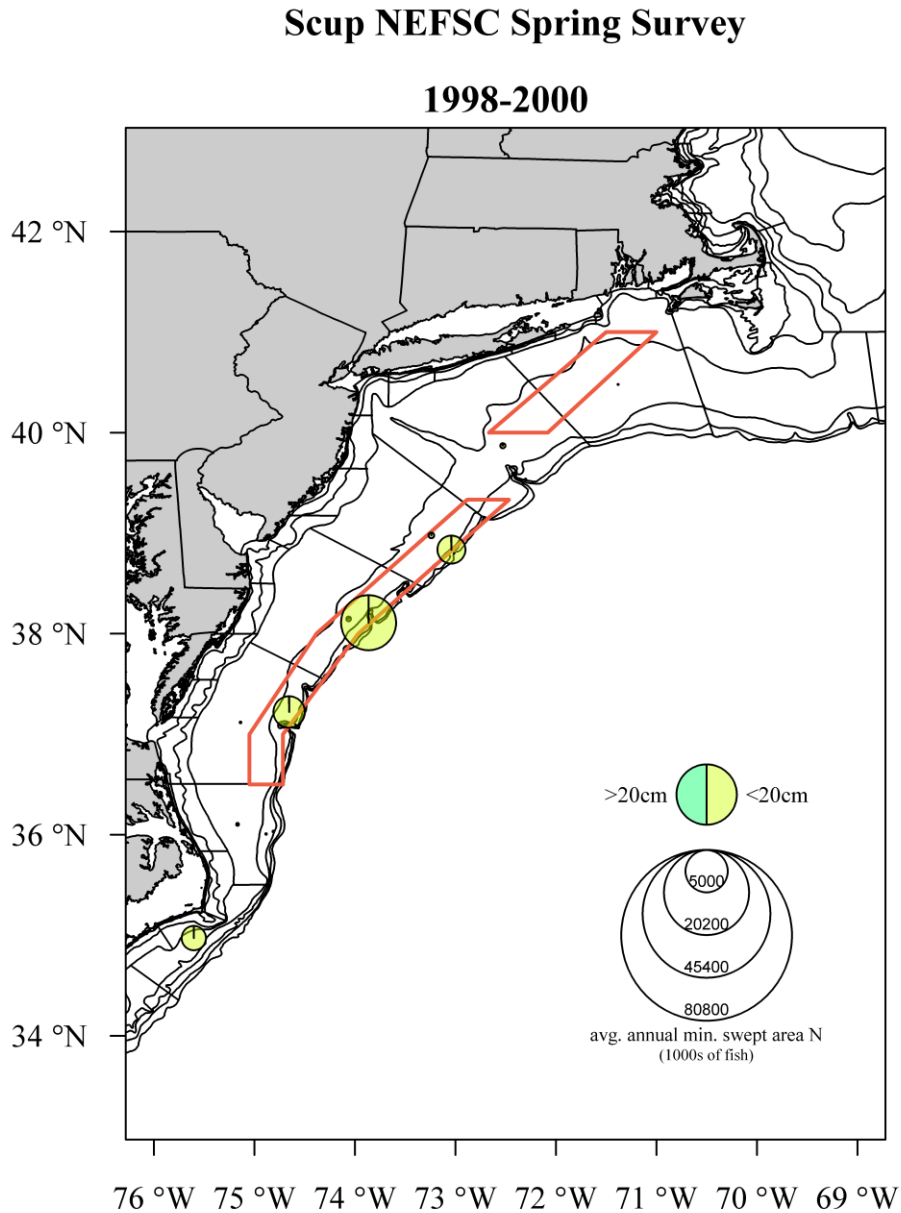


Figure 22. Size distributions of scup in NEFSC fall surveys 1998-2000. Yellow parts of the circles are fish ≤ 20 cm fork length and ages 0 and 1 fish; green slices are fish > 20 cm fork length and ages 2 and older. Size of the circle is proportional to stock size in numbers.

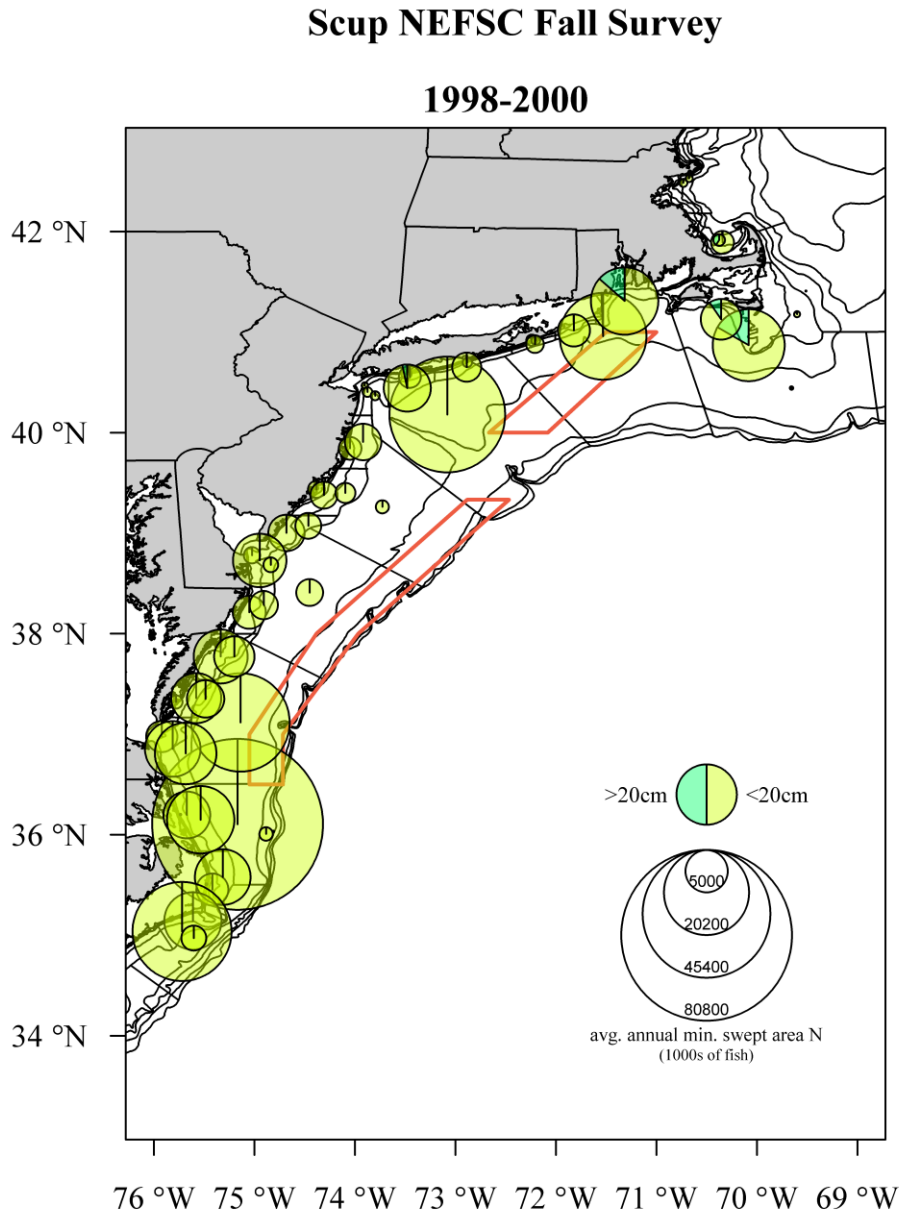


Figure 23. Size distributions of scup in NEFSC spring surveys 2010-2012. Yellow parts of the circles are fish ≤ 20 cm fork length and ages 0 and 1 fish; green slices are fish > 20 cm fork length and ages 2 and older. Size of the circle is proportional to stock size in numbers.

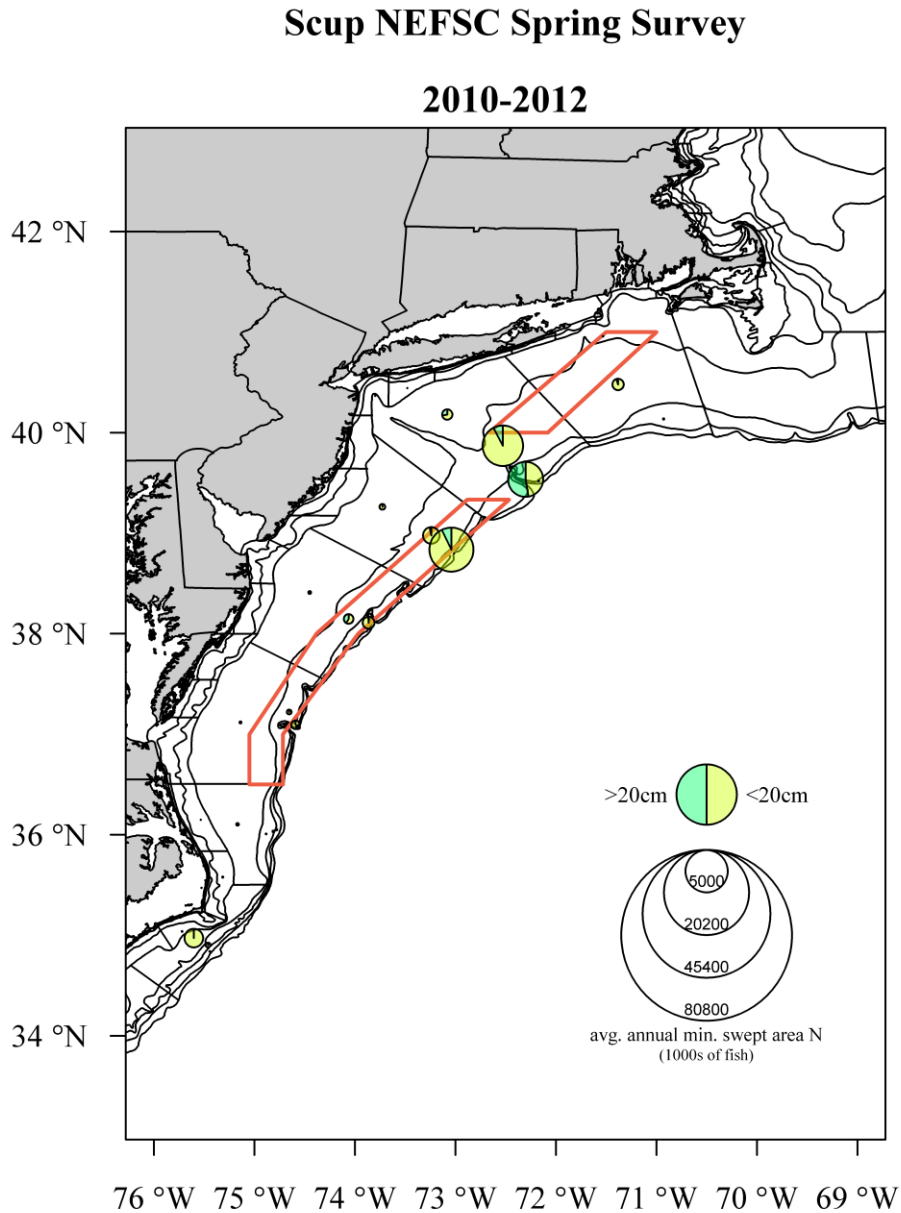


Figure 24. Size distributions of scup in NEFSC fall surveys 2010-2012. Yellow parts of the circles are fish ≤ 20 cm fork length and ages 0 and 1 fish; green slices are fish > 20 cm fork length and ages 2 and older. Size of the circle is proportional to stock size in numbers.

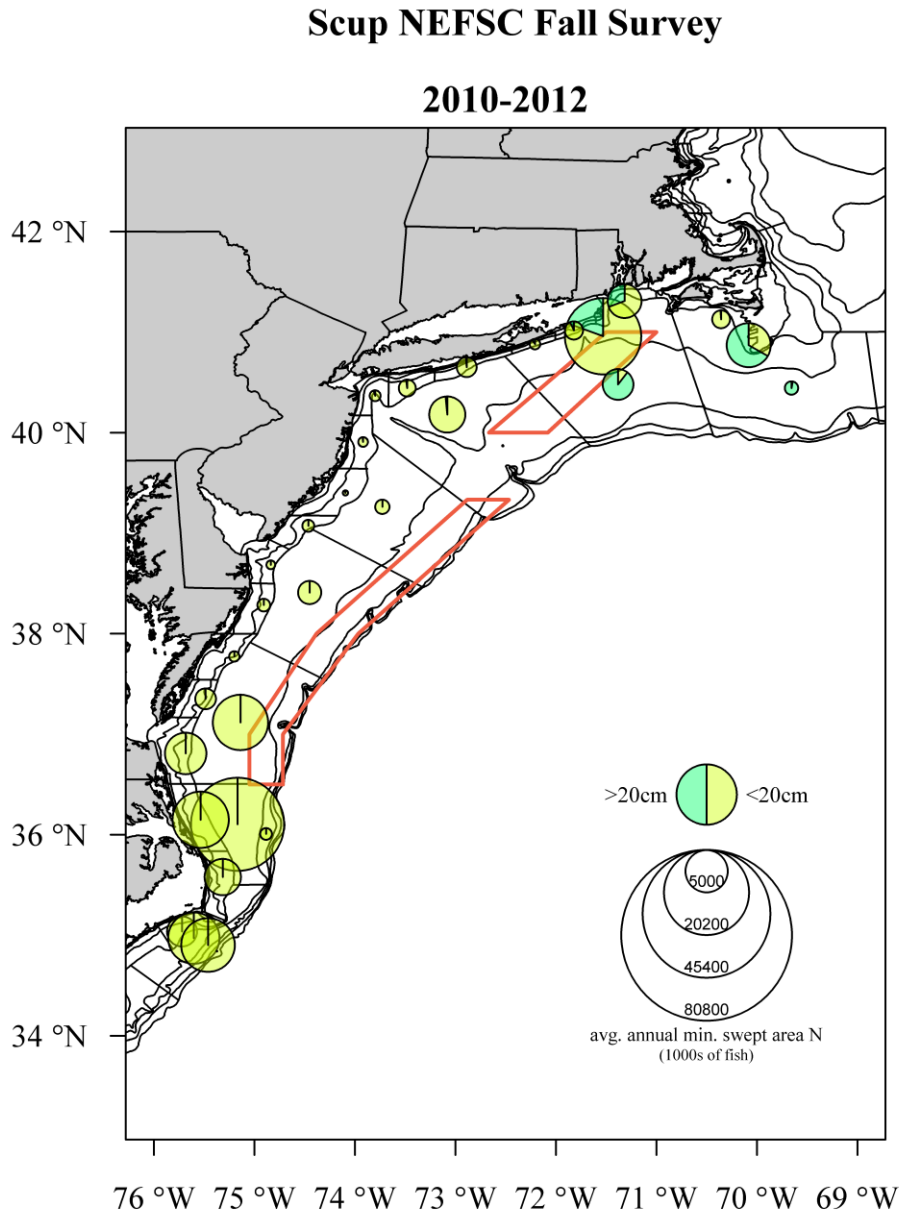


Figure 25. The total scup discards and percent of discards in the GRAs.

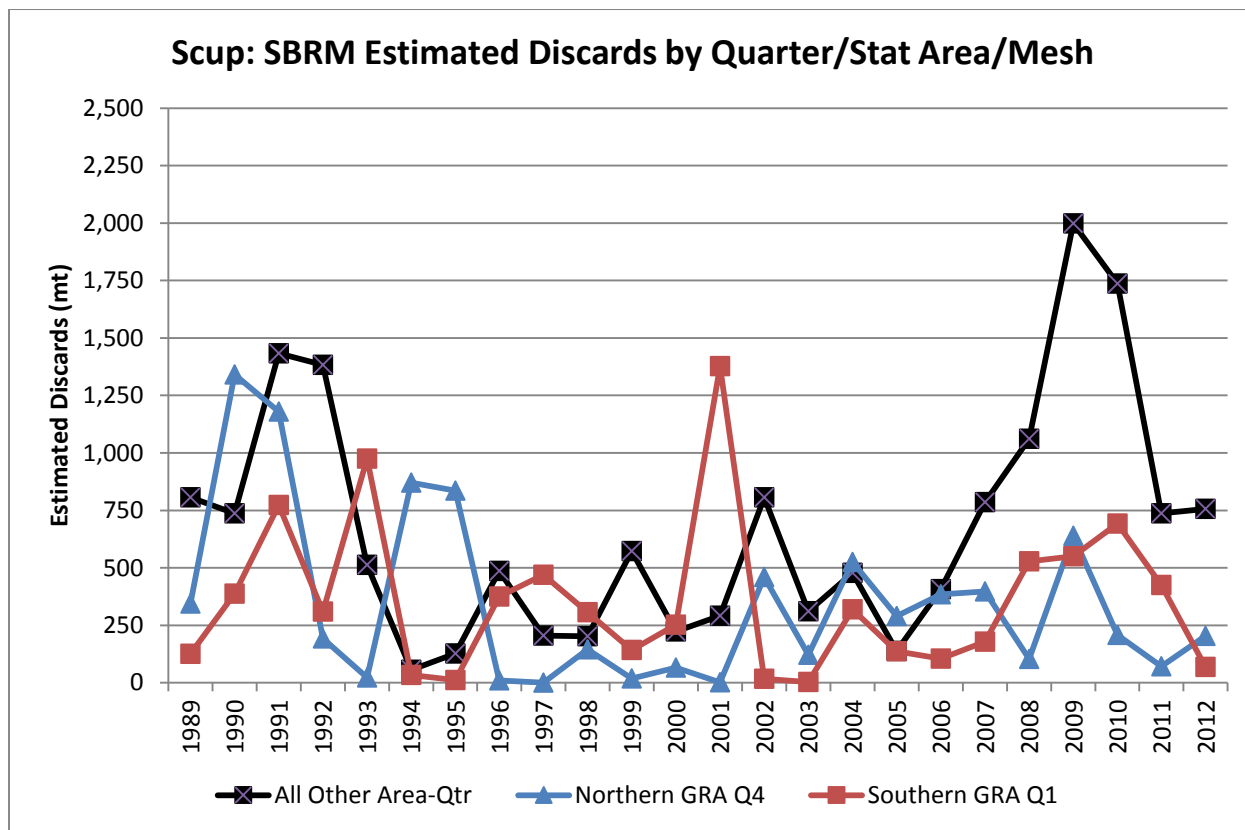


Figure 26. Discard components in the Northern and Southern GRAs compared to discards in all other statistical areas and quarters: 100% stacked histogram.

