#2a

New England Fishery Management Council
50 WATER STREET | NEWBURYPORT, MASSACHUSETTS 01950 | PHONE 978 465 0492 | FAX 978 465 3116
C. M. "Rip" Cunningham, Jr., *Chairman* | Paul J. Howard, *Executive Director*

MEMORANDUM

DATE: July 27, 2012

TO: Groundfish Oversight Committee

FROM: Groundfish Plan Development Team

SUBJECT: PDT Conference Call, July 25, 2012

1. The PDT held a conference call to discuss at-sea monitoring issues, sub-ACLs for SNE/MA windowpane flounder, changes to the sector ACE carry-over provisions, and ABCs for FY 2013 – 2015. Staff participating in the call were Tom Nies and Fiona Hogan (NEFMC), Steve Correia (Mass DMF), Michael Ruccio and Dan Caless (NMFS NERO), Chad Demarest, Paul Nitschke, and Evan Bing-Sawyer (NMFS NEFSC), Sally Roman (SMAST), and Sally Sherman (Maine DMR). Michael Palmer (NMFS NEFSC) and J. Michael Lanning (NMFS NERO) also participated in the call, as did Jenny Sun and Jessica Joyce (GMRI).

2. The PDT referred to several draft documents during the call: a draft report on discard length frequencies, a report on landings and discards proportional monitoring, a summary of realized stock and sector specific CVs for FY 2010 and 2011, a report on how CV affects catch estimates for sectors, a May 25, 2012 NERO letter to the Council on carry-over, and a straw man revision to carry-over provisions.

At –Sea Monitoring Issues

3. There were three sub-topics discussed: discard length frequencies, FY 2010 observer coverage in relation to the concept of allocating coverage by landings or discards, and determining the appropriate standard to use to determine the appropriate level of observer coverage.

Discard Length-Frequencies (l-f)

4. The Committee asked the PDT to investigate the l-f of discards. This request was to support a possible alternative that would reduce minimum sizes, as an alternative to the option that would

require full retention and would eliminate minimum size requirements. A report was prepared that summarizes the discarded l-f of groundfish stocks in several ways: by year, quarter, trawl mesh shape, trawl mesh size, statistical area, and depth (see enclosure (1), a separate document). The report will be incorporated into the analysis of a full retention policy since many of the issues overlap (the full retention report is enclosure (5), provided as a separate document).

5. The overall conclusion is that minor (e.g. 1 inch) reductions in minimum size would likely convert discards to landings for most, but not all, groundfish stocks. Table 1 lists each species and qualitatively summarizes the likely effects. The table also shows the minimum size that would be needed to reduce almost all of the current sub-legal discards.

6. The PDT considered whether there was a clear advantage to either eliminating the minimum size or making a change. The issues associated with each are similar, and the impacts largely on whether there are behavioral changes in the fishery that result from a change or elimination in minimum sizes. The paper explores these issues, but in brief:

- Changes to minimum size could lead to changes in behavior that result in changes in the size of fish captured. If the selectivity pattern of a species shifts to smaller fish, there are likely to be changes in the F_{MSY} (or its proxy), reductions in MSY values, and reductions in yields.
- For many groundfish stocks, smaller fish are less fecund, have lower egg survival, and are not as successful at spawning. These factors are not explicitly evaluated in the attached paper but need to be considered, as they could further affect long-term yields.
- There could be short-term delays in rebuilding programs for some stocks.
- If fishermen are required to land small fish that are not marketable, there could be issues related to the handling and reporting of these fish. For example, there have reportedly been some problems with dealers not reporting hagfish that cannot be sold.
- As noted previously, full retention is sometimes claimed to increase the efficacy of electronic monitoring (EM). Any exemption from this requirement (such as requiring fish to be discarded that are not allocated) will reduce the strength of this argument.

7. The PDT notes that there are tradeoffs that need to be considered between these two approaches, but does not have a recommendation for one over the other.

Distribution of Observer Coverage/Catch Proportional Monitoring

8. The PDT reviewed a draft paper prepared by Jenny Sun of GMRI that analyzed observer coverage for FY 2010 in order to determine if observer coverage is assigned equally to all categories. Trips were categorized as day trips (less than or equal to 24 hours) or multi-day trips (greater than 24 hours), and were binned according to vessel size in three size categories. The coverage was summarized based on number of trips, and then based on number of trips weighted

by groundfish landings or groundfish discards. A hypothesis test was used to test for equality of proportions.

9. The analyses will help address the question of whether observer coverage is distributed evenly. This may help in the evaluation of whether discard estimates may be biased. The draft results indicated that the conclusions may depend on which metric is used to measure coverage rates: trips, trips weighted by landings, or trips weighted by discards. This may complicate interpretation.

10. The PDT suggested expanding or modifying the analysis in several ways before finalizing it, and the GMRI representatives agreed to do so. The suggestions were:

- The distribution of trip lengths for fixed gear vessels suggests that a more appropriate break point for "day" (or short) and multi-day (or long) trips is 48 hours. Almost all fixed gear trips are less than 26 hours; a trip of just over one day would seem to be better binned with other day trips, rather than multi-day trips.
- The PDT requested an explanation of the weighting method and the hypothesis test.
- The PDT suggested that there may be difference between stocks that are important. One way to explore this would be to run the analyses for three stocks (GOM cod, GB haddock, and pollock were suggested).
- When FY 2011 data is available, the analysis should be repeated for 2011.

11. There was some discussion about how this information could be used. It is not clear that the ASM program should be designed to have equal coverage rates in all categories. While the language in Amendment 16 is not specific, it does state that sectors are responsible for designing an ASM program that at least meets the CV standard. It is conceivable that a homogenous sector might need fewer trips to meet such a standard, which would argue for difference coverage rates (however measured) between sectors. There was some discussion about using the information on different coverage rates to select trips at different rates within the categories.

12. Next the PDT reviewed the results of a simulation study that assigned different observer coverage rates to day and multi-day trips. Using a simulation tool developed to investigate the best way to estimate sector discards, the effects of targeting coverage on one trip length category over the other was investigated at different levels of observer coverage. These categories were not defined as a new stratum. When there are differences in discard rates between the two categories, allocating observer coverage in this way (without stratification) results in a bias in the discard estimate. The magnitude of the bias increases with higher levels of observer coverage. This suggests that if coverage is shifted to target specific categories, then it may be necessary to impose additional levels of stratification on the discard estimation process. Increased stratification usually requires higher overall observer coverage rates in order to meet a level of precision for each stratum.

Coefficient of Variation (CV) – What is the Correct Level of Observer Coverage? What is the Correct Standard?

13. Amendment 16 specifies that sector at sea monitoring will at least meet the CV requirement specified in the SBRM (30% CV). The amendment is not clear how this standard is to be applied, which has caused some confusion, and there is also some question about whether this is the correct standard to use to determine coverage levels. The PDT explored the implications of using CV as a standard for sector monitoring coverage by reviewing two documents: realized CVs by sector and stock for FY 2010 and FY 2011 (enclosure (2), separate document provided by NERO), and an exploration of the effects of CV and discard estimate bias on catch estimates (enclosure (3), separate document).

14. A review of other catch share monitoring programs uncovered surprisingly little analytic support for the levels of observer coverage that were adopted. In some cases the level of coverage was selected in order to have a high certainty of capturing rare, but important, takes of valuable (protected r endangered) species. Table 2 below gives an overview of the priorities of several at-sea monitoring programs that require 100 percent observer coverage.

15. Two of the objectives of the sector monitoring program are:

- Determine total catch and effort, for each sector and common pool, of target or regulated species
- Achieve coverage level sufficient to minimize effects of potential monitoring bias while maintaining as much flexibility as possible to enhance fleet viability

A question that needs to be answered is what level of observer coverage is needed to meet these two goals?

16. Enclosure (2) summarizes the sector and stock-specific CVs that were realized in FY 2010 and FY 2011. Solely on a stock basis, all CVs were lower than the 30% standard. On a sector and stock basis, however, there were many instances where the realized CV exceeded the standard. As noted before, Amendment 16 is not clear on how the standard should be applied. At the stock level, it would seem there was more coverage than needed to meet the standard; at the sector-stock level, it appears there was not enough. But there is another question that needs to be considered – is CV the correct standard for determining the coverage needed?

17. CV is nothing more than a measure of variability around an estimate of discards. A fixed CV standard implies that it is just as important to have a precise estimate of a small number as it is to have a precise estimate of a large number. If the concern is accurate estimates of sector catches for each stock (as suggested by the monitoring objective shown above), this may not be the case. This can be illustrated with actual results from the FY 2010 tables. A few examples are summarized in the table below (Table 3). They show that in order to achieve the target CV, many more trips would have to be observed to get a precise estimate of a small amount of discards. This would not be cost effective.

18. If the objective is to be certain that a sector has not exceeded its ACE, then there are three factors that interact: the amount of landings, the amount of discards and the uncertainty around both. It is generally assumed landings are known without error (or with very small errors) and so the uncertainty around the discard estimate is more important. Enclosure xxx explores the interaction between these factors.

19. If the nominal catch (landings plus the discard estimate) is less than the total ACE, the amount of the discards and the amount of the uncertainty in that discard estimate can be used to determine the probability that true catch (the landings plus the true discards) exceeds ACE. This is explored by determining the maximum nominal catch that will have a very low probability (2.5 pct. in the paper) that true catch exceeds the ACE. At low levels of discards <u>and without any bias in the discard estimate</u>, the CV has little influence on this maximum ACE. At least for a single stock, the increase in maximum ACE that results from a better CV may not be worth the cost of the additional observer coverage.

20. The presence of observer bias, however, has a large influence on the maximum ACE, and if observer bias is present then CV has more importance. This was explored by assuming that the true discards were two or three times the nominal discards. The effect is to reduce the maximum ACE by a considerable amount. For a discard rate of 10 percent, and different CVs, the influence of the bias on the maximum ACE is compared to the no bias case in Figure 1.

21. If the true discards are larger than the nominal estimate, it means that the discard rate on unobserved trips must be higher than the discard rate on observed trips. How much higher is a function of the observer coverage level and the bias. Higher levels of observer coverage mean that for a given bias the discard rate on observed trips must be much higher than on unobserved trips.

22. The implications of these analyses are:

- CV, by itself, may not be the appropriate standard for determining observer coverage levels needed to monitor sector catch quotas.
- A biased discard estimate will have more influence on the accuracy of sector catches than the CV standard. It is therefore critical to have enough coverage that the presence of bias can be detected; ideally coverage should provide a way to estimate the amount of bias.
- If CV is used as a standard, in whole or in part, it should be clarified how it is to be applied.

23. Next steps: the PDT is continuing to analyze data to determine if bias is present, and to attempt to quantify that bias. The goal is to link these analyses to together to create an ASM monitoring standard for sectors.

Additional Sub-ACLs for SNE/MA Windowpane Flounder

24. In August the Committee will discuss adopting additional sub-ACLs for SNE/MA windowpane flounder for the fluke, scup, and squid fisheries. The PDT reviewed estimates of catch by these fisheries provided by NERO. There are only two years of data, and unlike the scallop fishery which is primarily a dredge fishery, there is some question about the binning of catches to various FMPs. NERO representatives urged caution in using the data to specify and monitor sub-ACLs for these fisheries.

25. In light if the NERO comments, the PDT suggests that an alternative way to address the issue is to make the area-based accountability measures applicable across all trawl fisheries. This would remove the necessity to track catches by FMP, which can be difficult when trips are not declared into a specific fishery. NERO agreed to develop catch estimates by different trawl mesh categories in order to explore this concept. NOAA GC will be contacted to determine if this approach would meet legal requirements.

Carry-Over

26. Recent guidance on carry-over from NERO was reviewed and discussed by the PDT. The PDT summarized the key elements of the guidance as follows:

- When is carry-over allowed?
    - No change in biomass expected due to under-harvest:
        - Small amount may be allowed as long it does not result in exceeding the ACL or ABC in the fishing year the carryover applies. Analysis would need to show this small amount would likely be offset by other under – harvests such that it would not increase the likelihood total catch would not exceed thee ACL or ABC in year 2. Could be accounted for in management uncertainty.
    - Under harvest leads to appreciable increase over original projection in biomass in year 2
        - Impact of under harvest needs to be evaluated and year 2 ABC and ACL updated. Change could be result of an assessment update, or rerunning projection model with new catch and applying the ABC control rule to get a new value for ABC and ACL. Might be possible to do this formulaically. Another alternative – redistribute ABC that relies on regular under-harvest by other fishery components.

- Carry-over cannot result in authorizing a catch amount that exceeds the ABC set by the SSC.

27. Based on the guidance, the PDT outlined a carry-over approach that would comply with the legal and policy guidance (enclosure (4), attached). There could be three options that might be considered for the framework:

- No action: Carry-over limited to 10 percent of a sector's ACE. Justification would need to be provided to show this complies with legal requirements.

- Modified no action: Carry-over would be limited to some small amount (perhaps 10 percent, perhaps another value), but provisions would be added to restrict carry-over should stock conditions require it.

- Flexible carry-over approach: Based on the straw man, this approach would calculate the amount of carry-over that would be permitted each year, based on the under-harvest.

28. There are several questions that need to be addressed to fully develop the straw man approach:

- What is the purpose of carry-over? Is it to accommodate minor year-end shortfalls in catch, or is intended to serve as an ACE "savings bank"?
- How will it be administered?
- Should there be a minimum amount?
- What if stock conditions differ dramatically from what is expected?

29. The straw man approach is likely to create an annual large administrative burden that will detract from the time available to address other management issues. It should be clearly understood that in most cases, because of the requirement that allocations not exceed the ABC and that overfishing not occur in any given year, each pound not harvested in year 1 will not be available for harvest in year 2. Two examples are shown below (Table 4). One example is for a stock without a stock-recruit relationship (GOM cod), and the second is for a stock with a stock-recruit relationship (GB winter flounder). In both examples the increase in ABC in year two is not equal to the under-harvest in year 1. This raises a question of why any sector would choose to carry-over fish into the next year. It is likely that a large under-harvest will more likely be the result of an inability to catch a quota rather than a rationale decision to delay harvest for future benefits. This implies the under harvest is due to an over-allocation – the quota was set too high due to errors in the assessment. In such a situation, carry-over could adversely affect the stock. Another interesting observation is that in the GOM cod example, the increase in catch in year 3 is larger than the increase in catch in year 2, but the benefits of this higher catch would accrue to the entire fishery and not be limited to the sectors that reduced their catch in year 1.

ABCs

30. Because of a lack of time little progress was made on ABC issues. The PDT will schedule another call or meeting to address these issues.

Enclosures:

(1) Discard length-frequencies (separate document)
(2) FY 2010 and FY 2011 realized stock and stock/sector specific CVs for discard estimates (separate document)
(3) Effect of CV and bias on catch estimates (separate document)
(4) Strawman ACE carry-over concept (attached)
(5) Analysis of full retention (separate document)

Table 1 - Qualitative summary of impact on discards of changes in minimum size of one inch

Species	Discards affected by 1 inch reduction	Size (inches)	Minimum Size to reduce most discards
Cod	Yes	22 (55.9 cm)	18.9 in. (48 cm)
Haddock	Yes	18 (45.7 cm)	15.7 in (40 cm)
Pollock	No	19 (48.3 cm)	14.2 in. (36 cm)
Witch Flounder (gray sole)	Yes	14 (35.6 cm)	10.6 in. (27 cm)
Yellowtail Flounder	Yes	13 (33.0 cm)	11.8 in (30 cm)
American Plaice (dab)	Yes	14 (35.6 cm)	5.5 in. (25 cm)
Atlantic Halibut	No	41 (104.1 cm)	
Winter Flounder (blackback)	Yes	12 (30.5 cm)	7.5 in. (19 cm)
Redfish	No	9 (22.9 cm)	7.1 in. (18 cm)

Table 2 – Comparison of observer program priorities Extracted from "Comparison of At-Sea Catch Monitoring Programs with Full Observer Coverage to the Directed Atlantic herring Fishery – New England"; June 2012; a report prepared by MRAG Americas, Inc.

	NE Herring	HI Swordfish Longline	AK Pollock	WC At-Sea Hake	WC Trawl IFQ
Issues and Priority of Data collection (if applicable) *Data collection priority ranked in order or importance (1 is top priority); where lesser priority data would not be collected if time and conditions would not permit.*					
Federal Obs	No	No	No	No	No
Obs Primary Concern	Bycatch - River Herring, Tuna, MMs, seabirds	Bycatch - Turtles, MM, sharks	Bycatch - salmon	Bycatch - rebuilding stocks	Discard analysis
Obs Secondary Concern	Discard Analysis	Biological Sampling	Species Composition	Species Composition	Bycatch - critical stocks
Compliance Monitoring	4	4	6	6	5
MM Collection	5	4	4	5	6
Seabird Collection	5	4	4	5	6
Biological Samples	5	2	3	3	4
Length Frequencies	5	3	3	3	4
Observer Training Center Determination	6	3	5	4	3
Discard Weights	2	No	5	4	1
Species Composition Sampling	3	5	2	2	3
Prohibited Species Monitoring	1	1	1	1	2
Fishing Effort Data	4	5	6	6	5
Gear Measurements	4	No	No	6	No
Processor Recovery Rates	7	No	No	No	No
Shore Side Sampling	No	No	100%	100%	100%

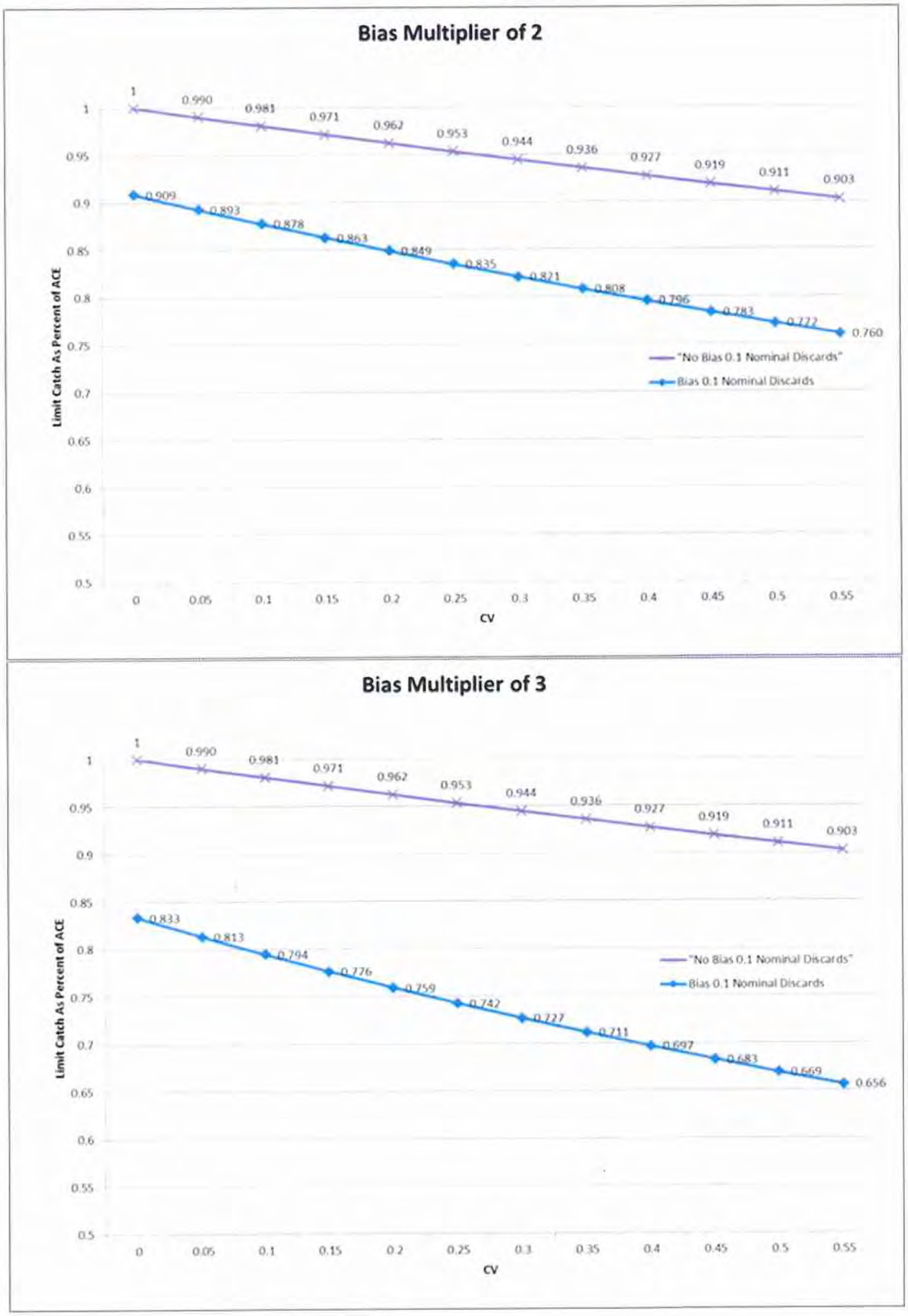
Table 3 – Examples of cost to achieve a stock- sector specific CV of 30 percent in FY 2010. Marginal cost calculated as $750 per additional trip; this estimate will be in error if trip length differs from one day.

Sector	Stock	Discards (lbs.)	Number of strata sub-trips	Number observed sub-trips	Percent sub-trips observed	Realized stock CV	Percent observer coverage required for CV30	Catch	Percent of ACE Caught	Marginal Cost to Achieve CV30 in FY 2010
SUST HARV 1	GB Winter Flounder	1,707	417	104	24.94	43.73	41.49	256,853	70.6	$ 51,760
NEFS 7	CC/GOM Yellowtail Flounder	618	73	20	27.4	66.57	65.75	38,544	60.1	$ 20,998
NEFS 9	GOM Haddock	59	50	14	28	44.61	48	13,285	63.8	$ 7,500

Table 4 – Example of effect of reduced catch in 2013 on catches in 2014 and 2015 at 75% of FMSY

GOM Cod (no s-r example)								
Year	Catch				Year	SSB		
2012	6,700	6,700	6,700		2012	8,618	8,618	8,618
2013	1,496	1,296	1,096		2013	10,323	10,360	10,396
2014	2,524	2,554	2,582		2014	16,754	16,967	17,144
2015	3,572	3,615	3,643		2015	23,692	23,959	24,142
GB Winter Flounder (s-r example)								
Year	Catch				Year	SSB		
2012	3,753	3,753	3,743		2012	14,173	14,173	14,173
2013	3,750	3,250	2,750		2013	12,909	13,055	13,192
2014	3,598	3,729	3,851		2014	12,904	13,361	13,799
2015	3,720	3,797	3,880		2015	13,313	13,569	13,859

Figure 1 – Maximum nominal catch that has a very low probability that actual catch exceeds ACE. Shown for a discard rate of 10 percent, two discard bias multipliers, and various CVs.



Enclosure (4)

Strawman Carry-over Approach

Determine total sector under-harvest in year 1 *(should total under-harvest be used, rather than sector under-harvest?)*

Determine impact of under-harvest on year 2 ABC (calculate new ABC/ACL)

Evaluate impact of new ABC/ACL on rebuilding program

Determine difference between new year 2 ABC and old Year 2 ABC (ACL?)

Compare under-harvest to difference

Carryover amount allowed each sector is:
Sector under-harvest * (difference/total sector under harvest)

Confirm carry-over will not adversely affect stock conditions

Increase ACL and ABC – but don't change fishery component values except for increased groundfish sub-ACL due to sector carry-over

Modify sector ACE to reflect carry-over

Should there be a minimum carry-over amount?

Advantages:

- Carry-over will always be equal to the increase in catch that results from the under-harvest; so it will not affect management uncertainty buffers
- Benefits of carry-over accrue directly to those that under harvest
- Approach will work whether stock increases or decreases (I think)
- Larger under harvest leads to larger carry-over

Disadvantages:

- Carry-over amount varies from year to year, and won't be known until catch info is available
- Lots of calculations need to be done quickly to distribute carry-over
- Always possible NERO may have to play the trump card due to poor stock conditions
- Can we change ABC/ACL without an actual Council action? Can we modify how the ABC/ACL is distributed without an amendment?
- ABCs and ACLs will constantly change if there is an under harvest

Enclosure (1)
Groundfish PDT report dated July 27, 2012

Length Frequency Analysis of Discards

The Groundfish Committee requested the PDT examine the established minimum sizes of the allocated groundfish (Table 1) following discussion of the large number of sub-legal yellowtail flounder (approximately 12" Total Length) being discarded. Some concern was raised about harvesting fish before they were able to reproduce. Fishermen are faced with paying for at sea monitoring from FY2013 and beyond. The reduction in regulatory discards could increase landings and reduce monitoring costs but may have unexpected impacts on a population if fishing behavior changes in response to markets developing for currently undersized fish.

ASM and NEFOP observer data from 2008 to 2012 were examined to determine the length distribution of discarded cod, haddock, Pollock, witch flounder, yellowtail flounder, American plaice, Atlantic halibut, winter flounder and redfish. This analysis focused on trawl gear, including variations such as the Ruhle trawl and the haddock separator trawl. A number of other parameters were looked at to detect any influences on the length frequency by statistical area, gear type, mesh size, mesh shape, depth, quarter and year. The observed numbers were not expanded to total catch.

It is not known what proportion newly mature fish contribute to each spawning population assuming their low fecundity at first spawning. For a number of species, fecundity and egg viability increases with size and age. The current minimum sizes were established to minimize the harvest of immature fish. The removal or reduction in the minimum size would result in a larger portion of immature fish being landed. The full impact on the population depends on changes in fishing behavior and the establishment of markets for small size fish. The short-term contribution of new spawners may be limited but their overall contribution may be substantial but difficult to estimate. By comparing current minimum sizes and size at maturity with observed discards, we can make inferences about these issues.

Cod

The majority of the total discards occurred just below the minimum size (Figure 1). The length at 50% maturity is below the minimum size suggesting a portion of these discards could be contributing to the spawning population. When examined proportionally a similar trend in discards is seen across years (Figure 2). Year appears to be an important factor in determining the number of discards in the raw data, however, the sample sizes vary greatly by year. The number of years used here are not long enough to determine any decadal trends or to compare to recruitment indices. To account for this, the observed numbers were expressed as a percentage of the total observed in that length class (Figure 3). This showed the percent contribution of a year to a particular length class. Both 2008 and 2009 contributed the highest percentages throughout the time series; the size classes differ with 2008 dominated by smaller sizes and 2009 with larger sizes. The later years add consistently lower percentages to the discards. A weighted average across years also indicates the highest level of discards occurs just below the legal minimum size (Figure 4). Approximately 90 percent are mature by the minimum size (Figure 5). The magnitude of discards did vary with depth, with the fewest observed discards in depths less than 25m and between 50 and 75 m, the majority were found in depths greater than 75m (Figure 6).

Otter trawl discarded the most cod with modified gear showing greatly reduced numbers (Figure 7). There were few cod observed in unknown, square/wrapped and combo mesh (Figure 8). The length frequencies were similar for diamond and square mesh, with diamond discards largely outweighing square mesh (Figure 8). When examined proportionally, to account for sample sizes, these two mesh shapes are very similar (Figure 9). Smaller mesh size corresponds to more discards but observed trips using larger mesh are much lower (Figure 10). Again accounting for sample size, 5.5 to 6.49 and 6.5 to 6.99 mesh sizes have similar discards (Figure 11).

Cod are discarded across a broad range of statistical areas; SA 521 has the highest level of discards. A similar length frequency is observed across the statistical areas but the magnitude varies with location (Figure 12). Cod discards remain constant throughout the year with an increase apparent in the first quarter (Figure 13).

Haddock

The majority of the total discards occurred just below the minimum size (Figure 14). The length at 50% maturity is below the minimum size suggesting a portion of these discards could be contributing to the spawning population. There are two peaks in haddock discards; a peak occurs in the 20 – 30 cm size range from 2010 to 2012 that doesn't occur in earlier years, while all years show a high level of discards over 40cm. The peak at smaller sizes may indicate a large year class but this needs to be confirmed with recruitment data. When examined proportionally a similar trend in discards is seen across years; the peak at smaller sizes is driven by later years (Figure 15). The percent contribution by year follows a similar trend with 2010 to 2012 contributing the most to the smaller size classes and to the 50 cm and larger sizes (Figure 16). Both 2008 and 2009 contributed the highest percentages to the mid-range, 35 cm to 60 cm. A weighted average across years also indicates the highest level of discards occurs just below the legal minimum size with a lesser peak just below 30 cm. (Figure 17). Approximately 90 percent are mature by the minimum size (Figure 18). The bimodal discard distribution was maintained in all parameters examined. The magnitude of discards did vary with depth, with the fewest observed discards in depths less than 25m and between 50 and 75 m (Figure 19). Observed discards increased over 70 m; the majority was found in depths between 25m and 50m (Figure 19).

Otter trawl discarded the most haddock with modified gear showing greatly reduced numbers (Figure 20). There were few haddock observed in unknown, square/wrapped and combo mesh (Figures 21). The length frequencies were similar for diamond and square mesh, with diamond discards largely outweighing square mesh (Figure 21). When examined proportionally, to account for sample sizes, these two mesh shapes are very similar (Figure 22). Smaller mesh size corresponds to more discards but the number of observed trips using larger mesh are much lower (Figure 23). Again accounting for sample size, 5.5 to 6.49 and 6.5 to 6.99 mesh sizes have similar discards (Figure 24).

Haddock were discarded in 17 statistical areas but SA 522 dominated the discards. Multiple peaks at smaller sizes vary with location (Figure 25). Haddock discards remain constant throughout the year with an increase apparent in the second quarter (Figure 26). Discards over 40cm peaked in Quarter 2 but varied by quarter at smaller sizes.

Pollock

The majority of the total discards occurred within a couple of centimeters of the minimum size (Figure 27). The size at 50% maturity coincides with the peak in discards (Figure 27). When examined proportionally a similar trend in discards is seen across years (Figure 28). The percent contribution by year is well mixed across the years (Figure 29). A weighted average across years also indicates the highest level of discards occurs just below the legal minimum size and when half the population is maturing (Figure 30). The magnitude of discards increased with depth, with the fewest observed discards in depths less than 25m and the majority in depth 75 m and over (Figure 31).

Otter trawl discarded the most pollock with modified gear showing greatly reduced numbers (Figure 32); the otter trawl trend closely follows the overall trend in discards. There were few haddock observed in square/wrapped mesh and none found in unknown and combo mesh (Figure 33). The majority of discards occurred in diamond mesh with some caught in square mesh (Figures 34). When examined proportionally, to account for sample sizes, these two mesh shapes are very similar (Figure 35).Smaller mesh size corresponds to more discards but the number of observed trips using larger mesh are much lower (Figure 36). Again accounting for sample size, 5.5 to 6.49 and 6.5 to 6.99 mesh sizes have similar discards (Figure 37).

Pollock were observed in 13 statistical areas; SA 515 had the highest number of observed discards (Figure 38). Pollock discards remain generally constant throughout the year (Figure 39).

Witch Flounder

The majority of the total discards occurred just below the minimum size (Figure 40). The size at 50% maturity coincides with the peak in discards (Figure 40). When examined proportionally a similar trend in discards is seen across years (Figure 41). The percent contribution by year is well mixed across the years, with 2010 dominating lengths less than 10cm (Figure 42). A weighted average across years also indicates the highest level of discards occurs just between the length at 50% maturity and minimum size (Figure 43). Approximately 70% of the population is mature at the minimum size (Figure 44). The magnitude of discards increased with depth, with the majority in depth 75 m and over (Figures 45).

Otter trawl discarded the most witch flounder with modified gear showing greatly reduced numbers (Figure 46). There were few witch flounder observed in unknown, square/wrapped and combo mesh (Figure 47). The majority of discards occurred in both diamond mesh, closely followed by square mesh (Figure 47). When examined proportionally, to account for sample sizes, are mesh shapes are fairly similar (Figure 48). Smaller mesh size corresponds to more discards but the number of observed trips using larger mesh are much lower (Figure 49). Again accounting for sample size, all mesh sizes also have similar discards (Figure 50).

Witch flounder were observed in 24 statistical areas; SA 522 had the highest number of observed discards (Figure 51). Witch flounder discards remain constant throughout the year (Figure 52).

Yellowtail Flounder

The peak in total discards occurred at the minimum size (Figure 53). The size at 50% maturity is below the peak in discards (Figure 53). When examined proportionally a similar trend in discards is seen across years (Figure 54). The percent contribution by year is well mixed across the years, with 2010 dominating lengths less than 10cm and 2008 and 2009 above 10 cm (Figure 55). A weighted average across years also indicates the highest level of discards occurs at the minimum size; a large number of discards occur in the 5cm difference between the length at 50% maturity and minimum size (Figure 56). Approximately 90% of the population is mature at the minimum size for all 3 stocks (Figure 57). Discards decreased with depth, with the fewest observed discards in depths 75m and over; the majority occurred between 25m and 50m (Figure 58).

Otter trawl discarded the most yellowtail flounder; modified gear showed greatly reduced numbers (Figure 59). There were few yellowtail flounder observed in in unknown, square/wrapped and combo mesh (Figure 60). The majority of discards occurred in square mesh; diamond mesh was less than half of the square mesh discards (Figure 60). When examined proportionally, to account for sample sizes, all mesh shapes are fairly similar (Figure 61).Smaller mesh size corresponds to more discards but the number of observed trips using larger mesh are much lower (Figure 62). Again accounting for sample size, all mesh sizes have similar discards (Figure 63).

Yellowtail flounder were observed in 17 statistical areas; SA 514 had the highest number of observed discards (Figure 64). Yellowtail flounder discards remain constant throughout the year with Quarter 3 being slightly higher (Figure 65).

American Plaice

The majority of the total discards occurred just below the minimum size; the peak occurred at the same size range across years (Figure 66). The size at 50% maturity is below the peak in discards (Figure 66). When examined proportionally a similar trend in discards is seen across years with one small peak in 2012 at around 15 cm (Figure 67). The percent contribution by year is mostly dominated by 2008 across the size range (Figure 68). A weighted average across years shows the highest level of discards occurs between the minimum size and the size at 50% maturity (Figure 69). Maturity ogives are unavailable for this species; an estimate of the percentage mature at the minimum size is unavailable. Discards generally increased with depth, with the fewest observed discards in depths less than 25m; the majority occurred over 75m (Figure 70).

Otter trawl discarded the most American plaice; modified gear showed greatly reduced numbers (Figure 71). There were few American plaice observed in unknown, square/wrapped and combo mesh (Figure 72). The majority of discards occurred in diamond followed by square mesh (Figure 73). When examined proportionally, to account for sample sizes, all mesh shapes are fairly similar (Figure 74). Smaller mesh size corresponds to more discards but the number of observed trips using larger mesh are much lower (Figure 75). Again accounting for sample size, smaller mesh sizes appear to peak at a slightly larger total length than larger mesh sizes (Figure 76).

American plaice were observed in 15 statistical areas; SA 522 had the highest number of observed discards (Figure 77). American plaice discards remain constant throughout the year (Figure 78).

Atlantic Halibut

The majority of the total discards occurred well below the minimum size, with a few occurring above it (Figure 79). When examined proportionally a similar trend in discards is seen across years (Figure 80). The percent contribution by year is well mixed across the years (Figure 81). A weighted average across years also indicates the highest level of discards occurs well below the minimum size; the length at 50% maturity is unknown (Figure 82). Maturity ogives are unavailable for this species; an estimate of the percentage mature at the minimum size is unavailable. Discards generally increased with depth, with the fewest observed discards in depths less than 25m; the majority occurred over 75m (Figure 83).

Otter trawl discarded the most Atlantic halibut; modified gear showed greatly reduced numbers (Figure 84). There were few Atlantic halibut observed in unknown, square/wrapped and combo mesh (Figure 85). The majority of discards appeared to occur in diamond mesh (Figure 85), however, when examined proportionally, to account for sample sizes, no clear trend appears (Figure 86).Smaller mesh size corresponds to more discards but the number of observed trips using larger mesh are much lower; no observed discards occurred in mesh larger than 7.5 (Figures 87). Again accounting for sample size, no clear trend mesh sizes is apparent (Figure 88).

Halibut were observed in 12 statistical areas but it was well mixed across strata (Figure 89). Halibut discards are well mixed throughout all quarters (Figures 90).

Winter Flounder

The majority of the total discards occurred just below the minimum size and corresponds to the size at 50% maturity (Figure 91). When examined proportionally a similar trend in discards is seen across years (Figure 92). The percent contribution by year is well mixed across the years (Figure 93). A weighted average across years also indicates the highest level of discards occurs just below the minimum size; the length at 50% maturity is close to the peak in discards (Figure 94). Winter flounder mature over a narrow size range. Approximately 80% are mature at the minimum size (Figure 95). Discards decreased with depth, with the fewest observed discards in depths 75m and over; the majority occurred in less than 25m (Figures 96).

Otter trawl discarded the most winter flounder; modified gear showed greatly reduced numbers (Figure 97). There were few winter flounder observed in unknown, square/wrapped and combo mesh (Figure 98). The majority of discards occurred in diamond and square mesh but the former has a broader length distribution (Figure 98). When examined proportionally, to account for sample sizes, square caught slightly more discards than diamond and other mesh shapes appear to have caught even more (Figure 99). Smaller mesh size corresponded to more discards but the number of observed trips using larger mesh are much lower (Figure 100). Again accounting for sample size, larger mesh sizes are capable of catching more discards than smaller ones (Figure 101).

Winter flounder were observed in 19 statistical areas; SA 514 had the highest number of observed discards (Figure 102). Winter flounder discards are greater in Quarters 2 and 3 and are at a lower level for the rest of the year (Figure 103).

Redfish

The majority of the total discards occurred above the minimum size and the size at 50% maturity (Figure 104). When examined proportionally a similar trend in discards is seen across years (Figure 105). The percent contribution by year is well mixed across the years (Figure 106). A weighted average across years shifts the peak in discards to the minimum size (Figure 107). Approximately 60% are mature at the minimum size (Figure 108). Discards increased with depth, the majority occurred in more than 75m but the majority occurs above the minimum size which is different to other species (Figures 109).

Otter trawl discarded the most redfish; modified gear showed greatly reduced numbers (Figure 110). There were few Redfish observed in unknown and square/wrapped mesh (Figure 111). The majority of discards occurred in diamond mesh; discards in square mesh were an order of magnitude lower (Figure 111). When examined proportionally, to account for sample sizes, these two mesh shapes are very similar (Figure 112). Smaller mesh size corresponded to more discards but the number of observed trips using larger mesh are much lower; no observed discards occurred in mesh larger than 7.5 (Figures 113). Again accounting for sample size, all mesh sizes have similar discards (Figure 114)

Redfish were observed in 13 statistical areas; SA 521 had the highest number of observed discards (Figure 115). Redfish discards are greater in Quarters 1 and decreased to a lower level for the rest of the year (Figure 116).

Conclusions

Large numbers of sub-legal sized fish are being discarded for allocated groundfish. A reduction in the minimum size would reduce discards on some species but may not have a significant effect for others because factors other than the minimum size regulations are driving those discards. A reduction in the minimum size, e.g. by an inch, is expected to reduce discards for cod, haddock, witch flounder, yellowtail flounder, plaice and winter flounder; reductions for pollock, halibut and redfish may not be as significant. Estimates of revised minimum sizes that would reduce a large portion of sub-legal discards are provided in Table 2. Some of these estimates are below the length at 50% maturity. For the species where estimates of size at 50% maturity are available, it is clear that the majority of the fish over the minimum size is mature and has a higher probability of having already contributed to the spawning population. The initial contribution of newly maturing fish to the spawning population may be small but their lifetime fecundity may contribute significantly. The reduction or removal of the minimum size regulations would alter the ratio of mature and immature fish. If the minimum size is reduced more mature fish would be removed. Potential impacts are explored in the full retention section but it is thought to decrease long-term yield if a shift in selectivity occurs. The amount of small sized fish that are kept would be market dependent.

The analysis also indicates that changes to trawl gear mesh size or configuration could also reduce discards.

Enclosure (1)
Groundfish PDT report dated July 27, 2012

Species	Size (inches)
Cod	22 (55.9 cm)
Haddock	18 (45.7 cm)
Pollock	19 (48.3 cm)
Witch Flounder (gray sole)	14 (35.6 cm)
Yellowtail Flounder	13 (33.0 cm)
American Plaice (dab)	14 (35.6 cm)
Atlantic Halibut	41 (104.1 cm)
Winter Flounder (blackback)	12 (30.5 cm)
Redfish	9 (22.9 cm)

Table 1 – No Action Minimum Fish Sizes (TL) for Commercial Vessels

Species	Discards affected by 1 inch reduction	Size (inches)	Minimum Size to reduce most discards
Cod	Yes	22 (55.9 cm)	18.9 in. (48 cm)
Haddock	Yes	18 (45.7 cm)	15.7 in (40 cm)
Pollock	No	19 (48.3 cm)	14.2 in. (36 cm)
Witch Flounder (gray sole)	Yes	14 (35.6 cm)	10.6 in. (27 cm)
Yellowtail Flounder	Yes	13 (33.0 cm)	11.8 in (30 cm)
American Plaice (dab)	Yes	14 (35.6 cm)	5.5 in. (25 cm)
Atlantic Halibut	No	41 (104.1 cm)	
Winter Flounder (blackback)	Yes	12 (30.5 cm)	7.5 in. (19 cm)
Redfish	No	9 (22.9 cm)	7.1 in. (18 cm)

Table 2 – Qualitative summary of impact on discards of changes in minimum size of one inch

Enclosure (1)
Groundfish PDT report dated July 27, 2012

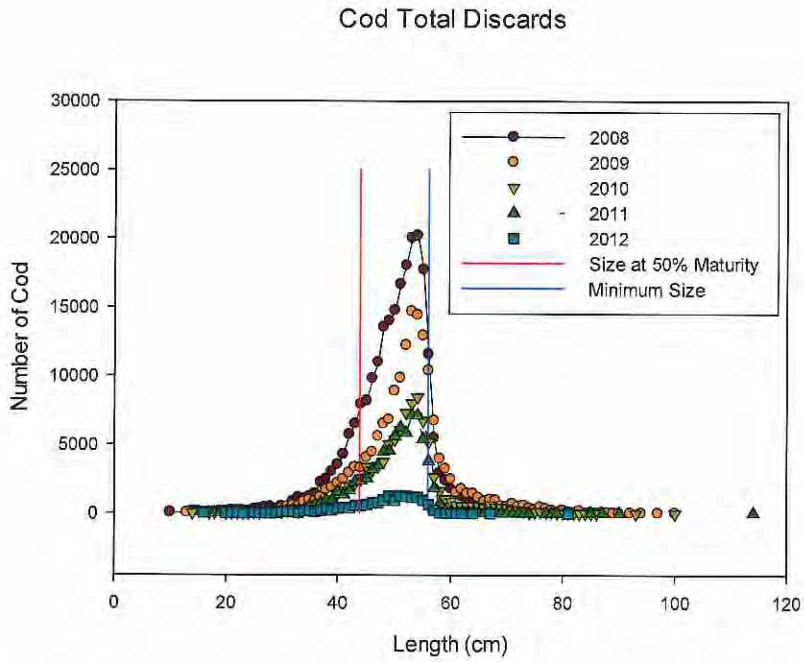


Figure 1: Total discards of cod from ASM and NEFOP data from 2008 – 2012.

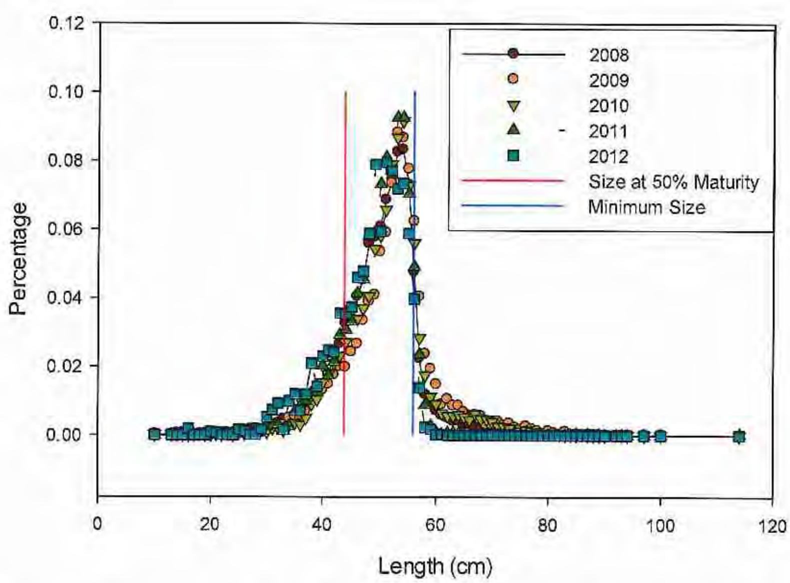


Figure 2: Proportional total discards of cod from ASM and NEFOP data from 2008 – 2012.

Enclosure (1)
Groundfish PDT report dated July 27, 2012

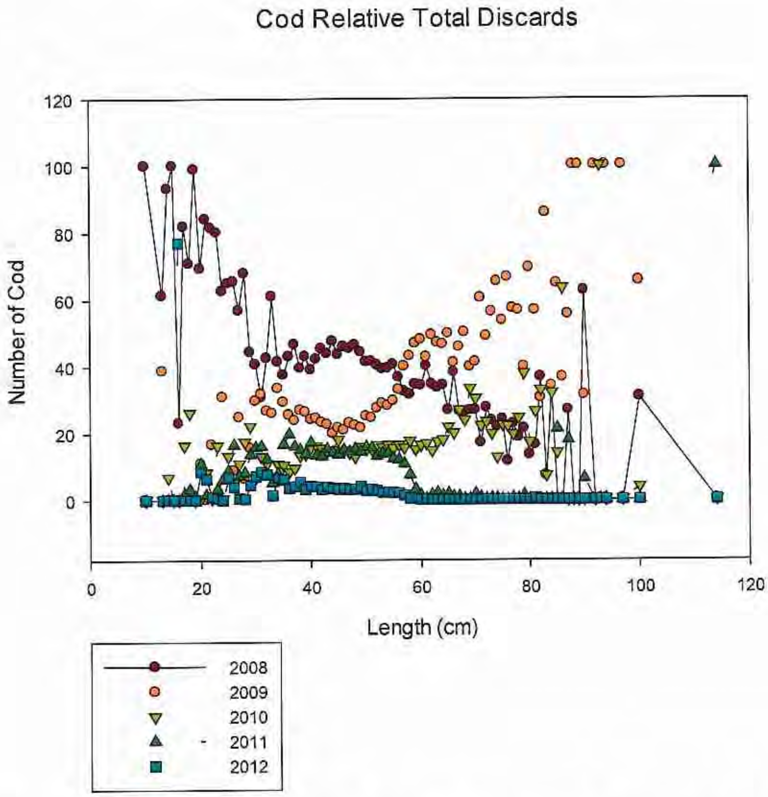
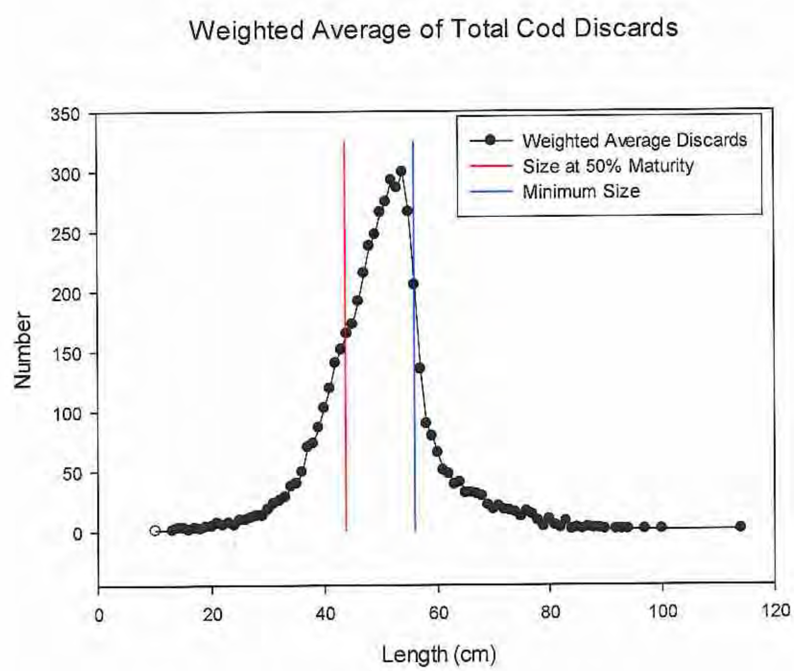


Figure 3: Relative total discards of cod expressed as a percentage of the total.



Enclosure (1)
Groundfish PDT report dated July 27, 2012

Figure 4: Weighted average total discards of cod.

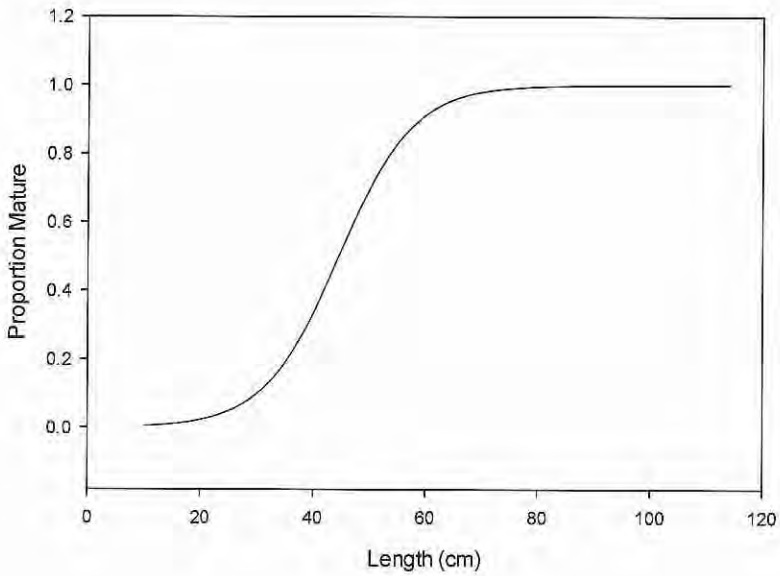


Figure 5: Maturity Ogive for Georges Bank cod.

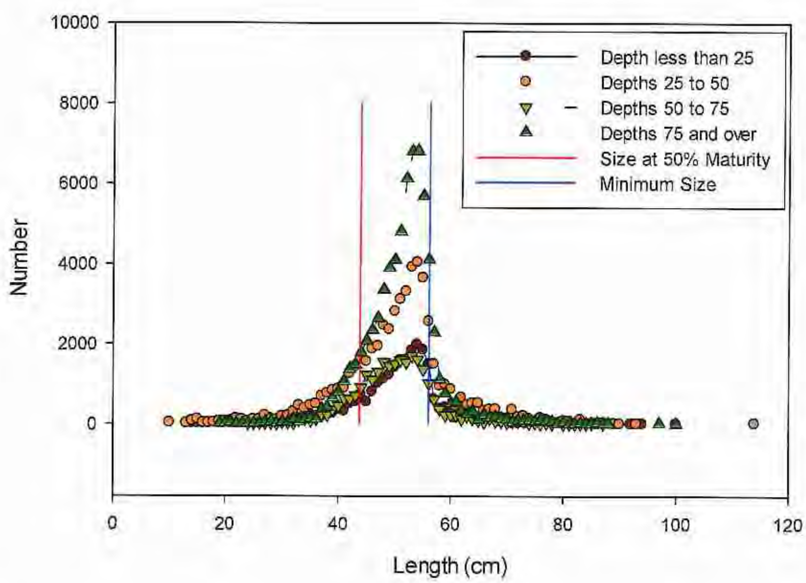


Figure 6: Observed cod discards by depth.

Enclosure (1)
Groundfish PDT report dated July 27, 2012

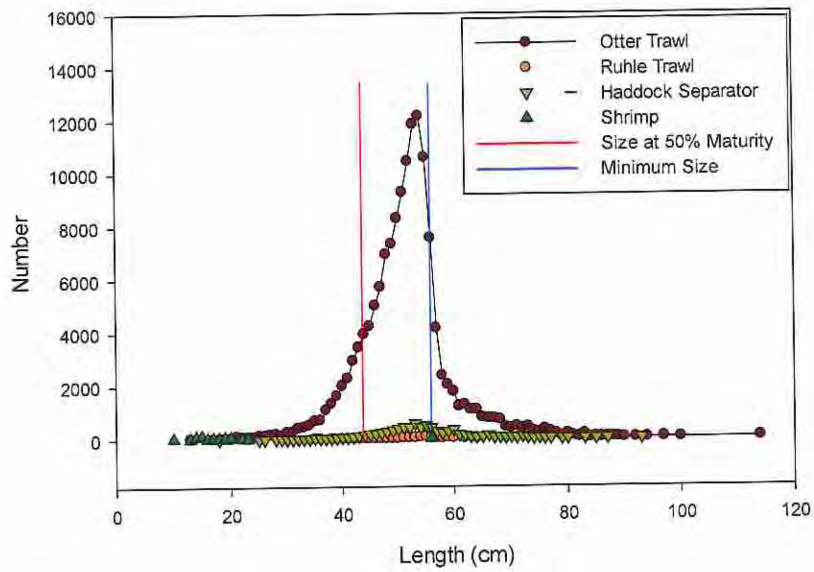


Figure 7: Observed cod discards by gear type.

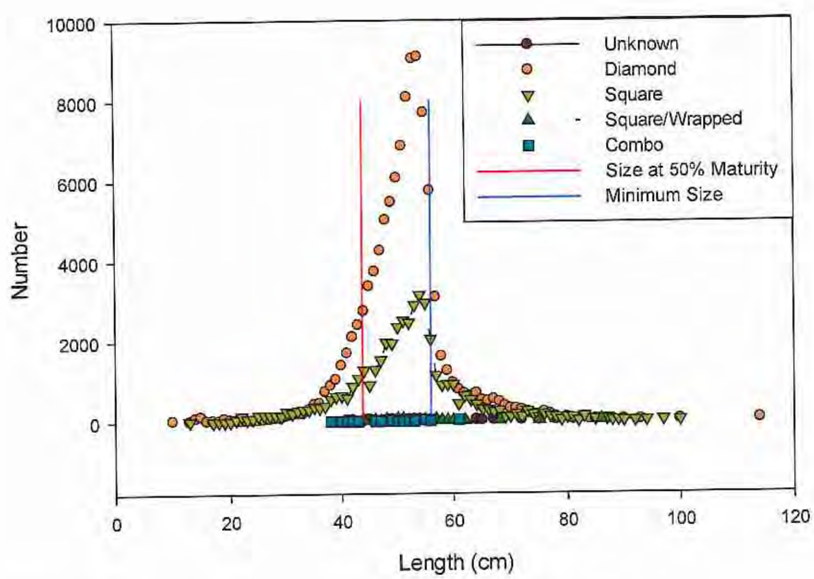


Figure 8: Observed cod discards by mesh shape.

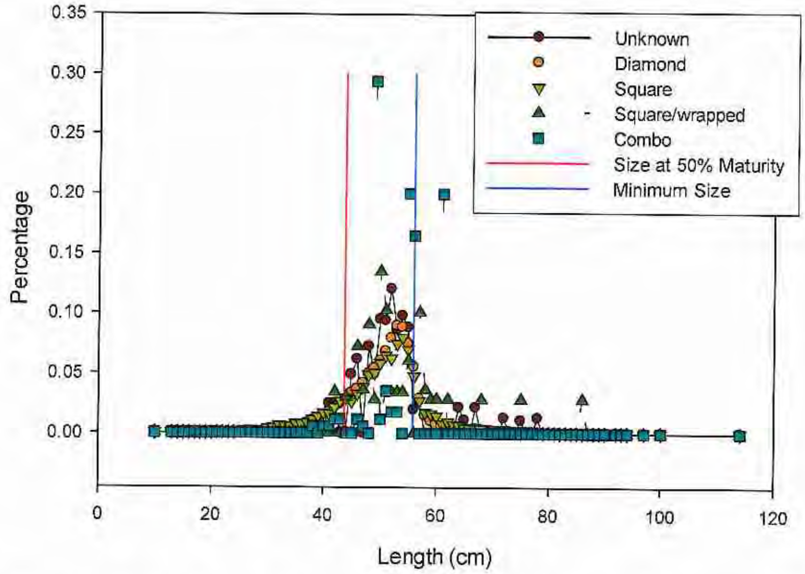


Figure 9: Proportional observed cod discards by mesh shape.

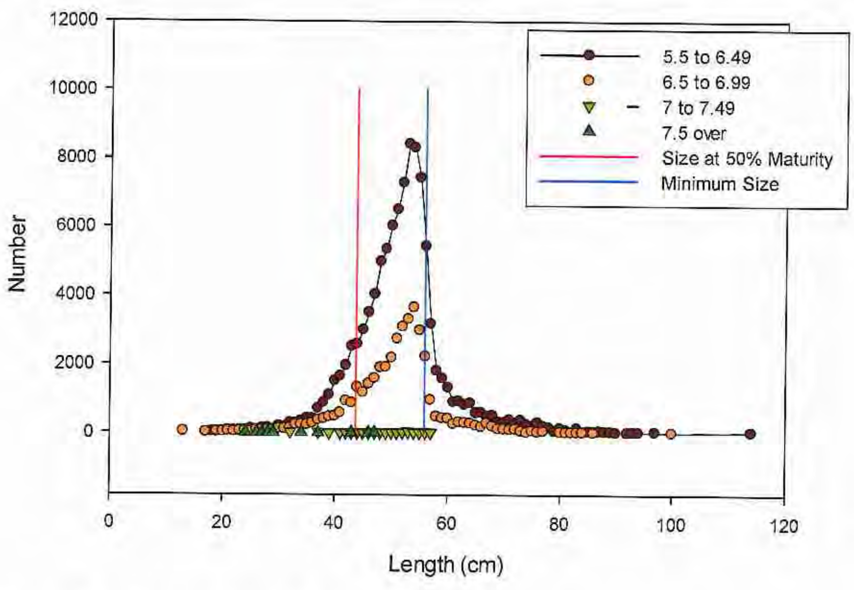


Figure 10: Observed cod discards by mesh size.

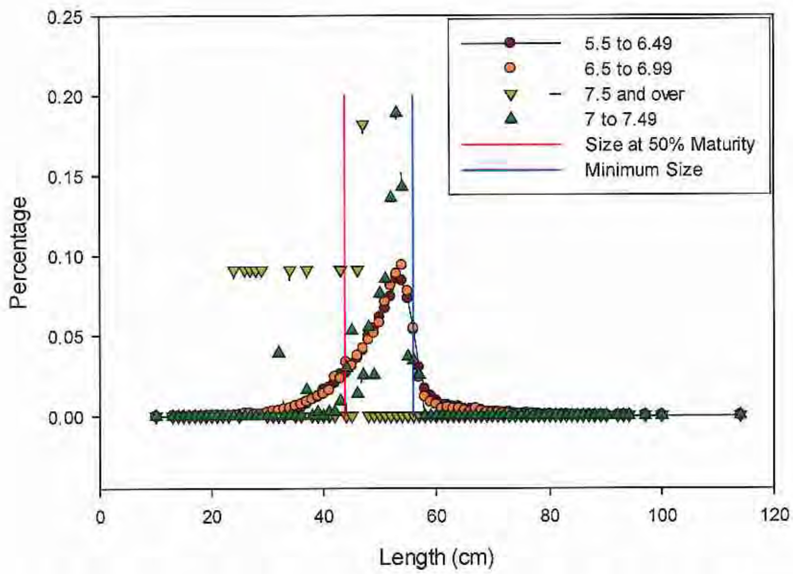


Figure 11: Proportional observed cod discards by mesh size.

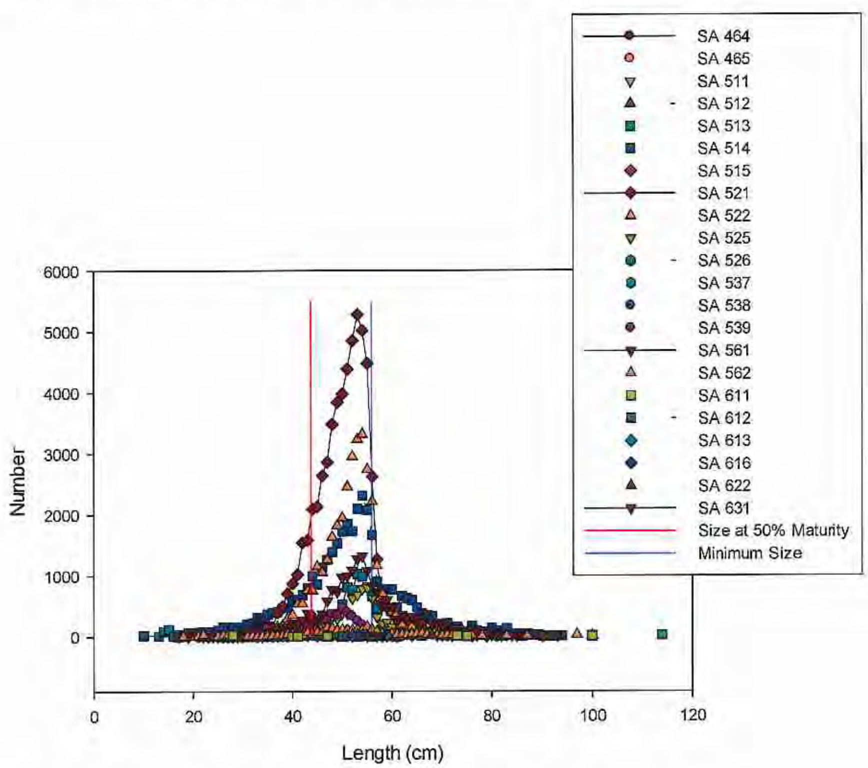


Figure 12: Observed cod discards by statistical area.

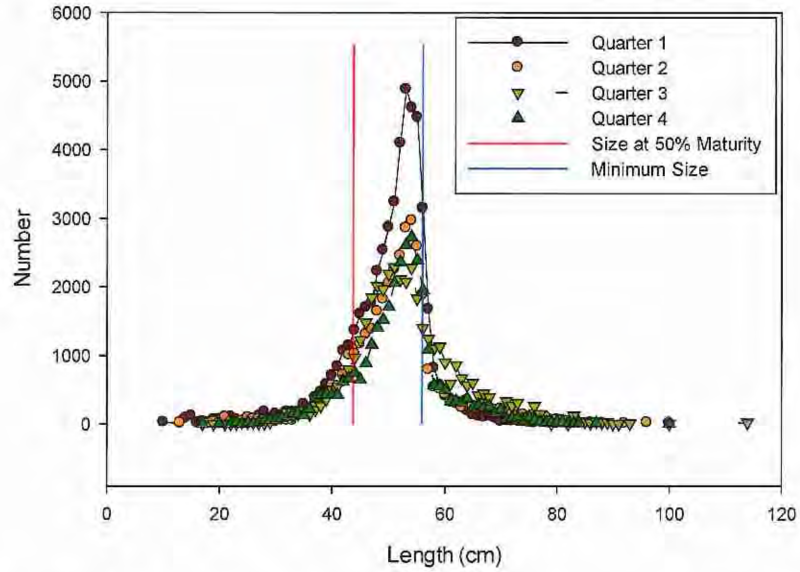


Figure 13: Observed cod discards by quarter.

Enclosure (1)
Groundfish PDT report dated July 27, 2012

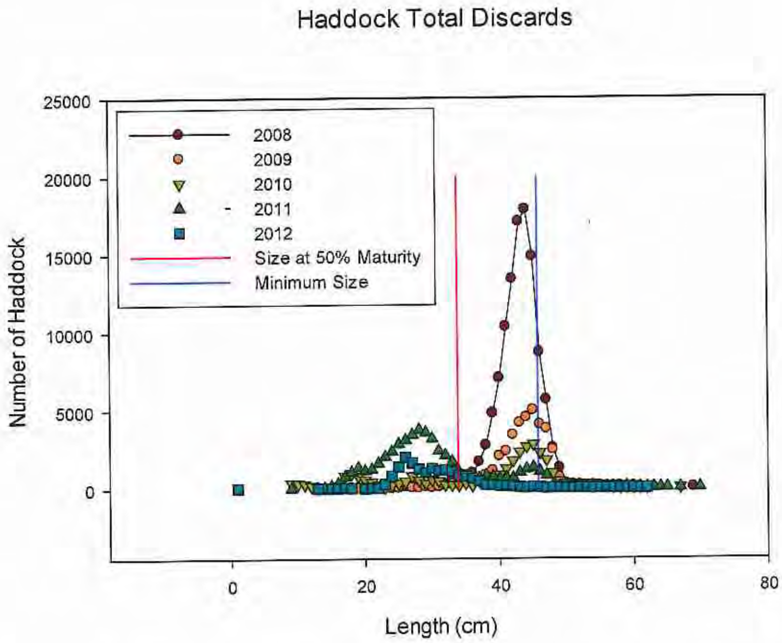


Figure 14: Total discards of haddock from ASM and NEFOP data from 2008 – 2012.

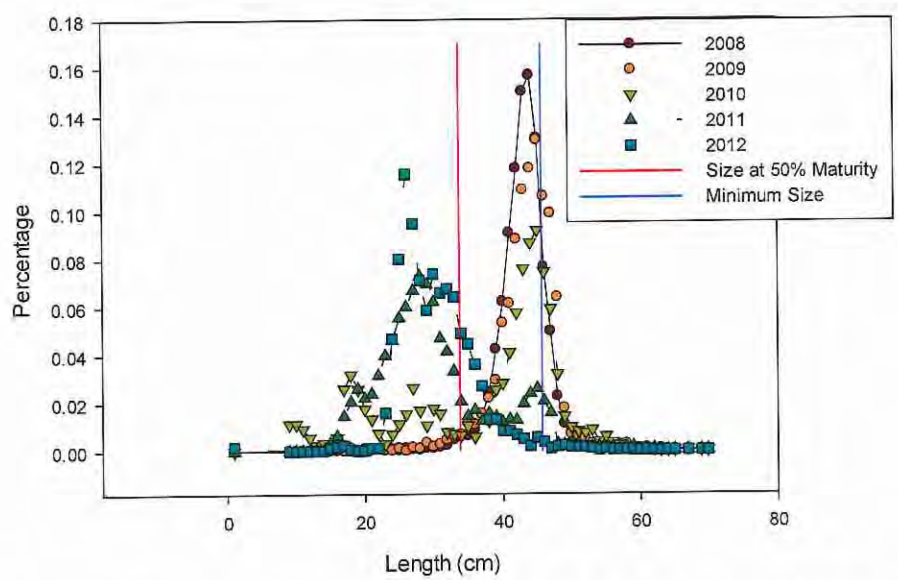


Figure 15: Proportional total discards of haddock from ASM and NEFOP data from 2008 – 2012.

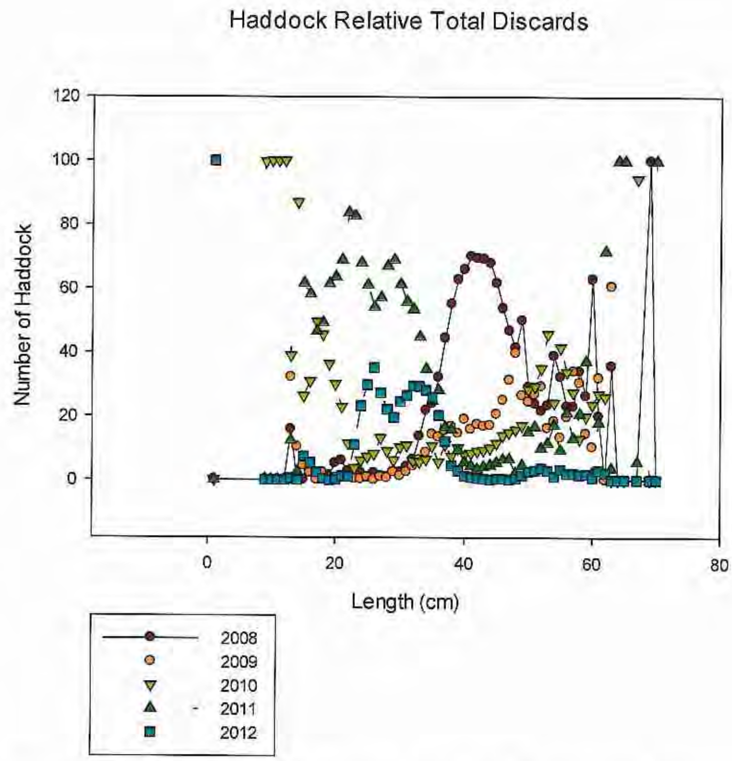


Figure 16: Relative total discards of haddock expressed as a percentage of the total.

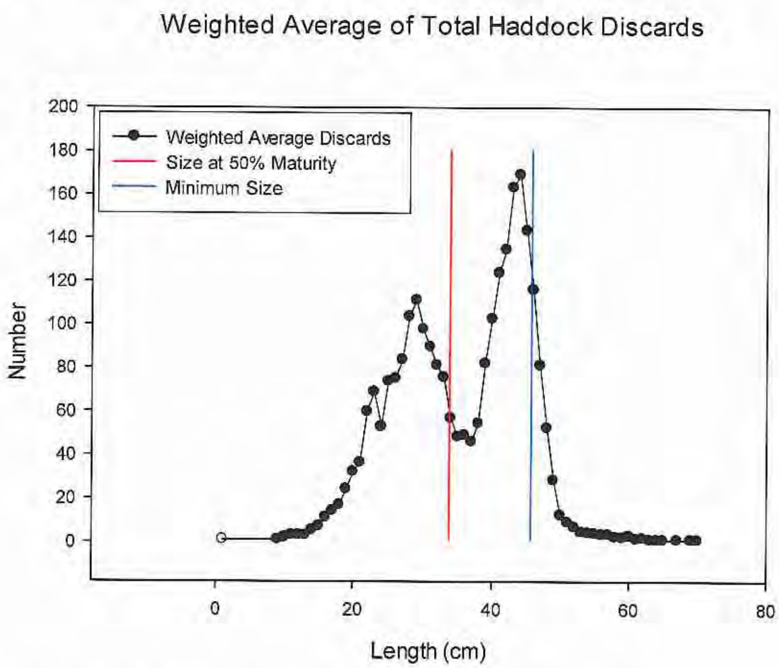


Figure 17: Weighted average total discards of haddock.

Enclosure (1)
Groundfish PDT report dated July 27, 2012

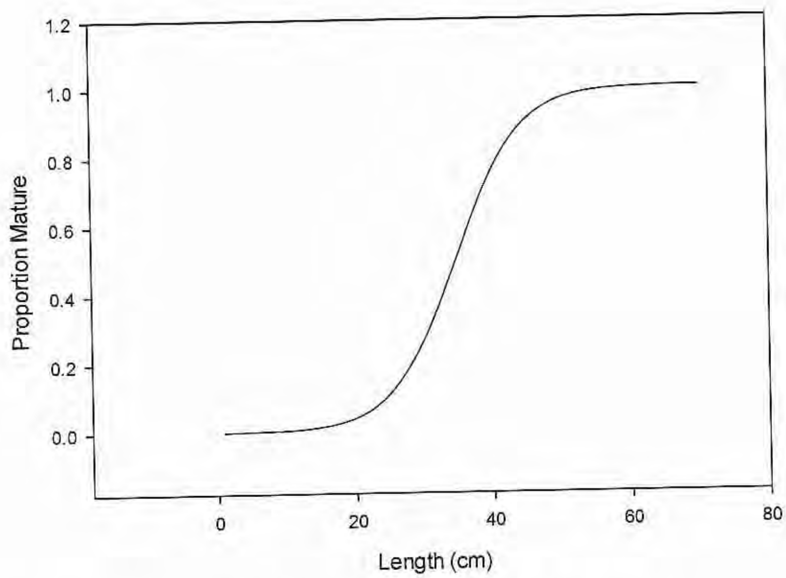


Figure 18: Maturity Ogive for Georges Bank Haddock.

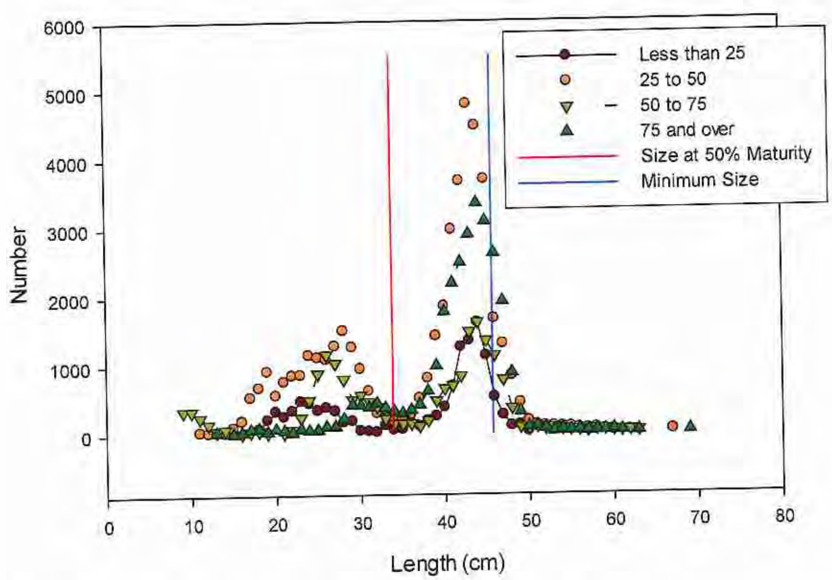


Figure 19: Observed haddock discards by depth.

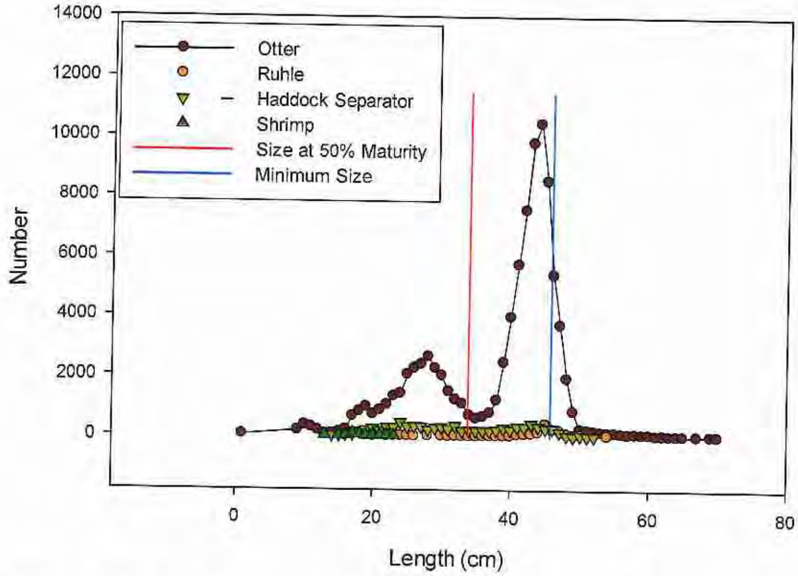


Figure 20: Observed haddock discards by gear type.

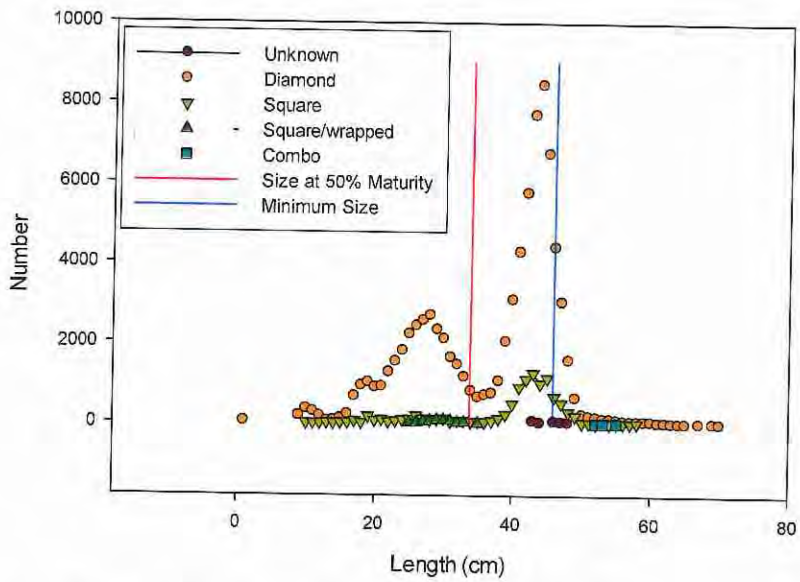


Figure 21: Observed haddock discards by mesh shape.

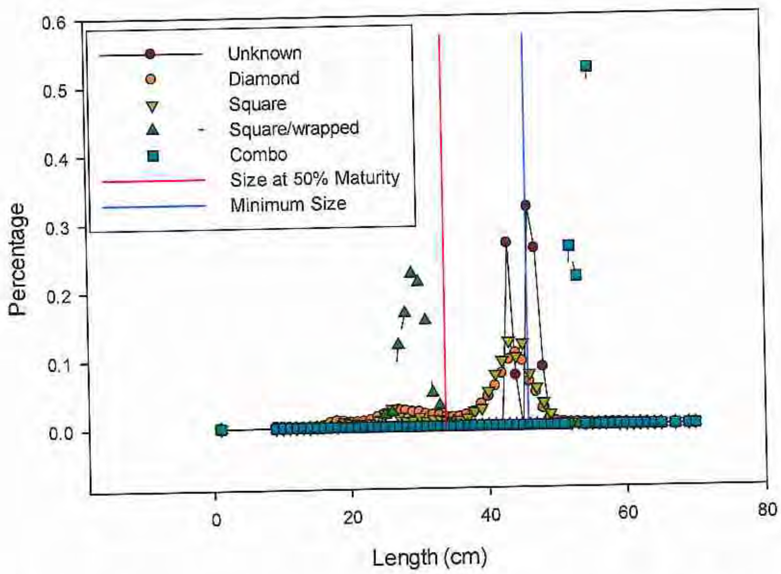


Figure 22: Proportional observed haddock discards by mesh shape.

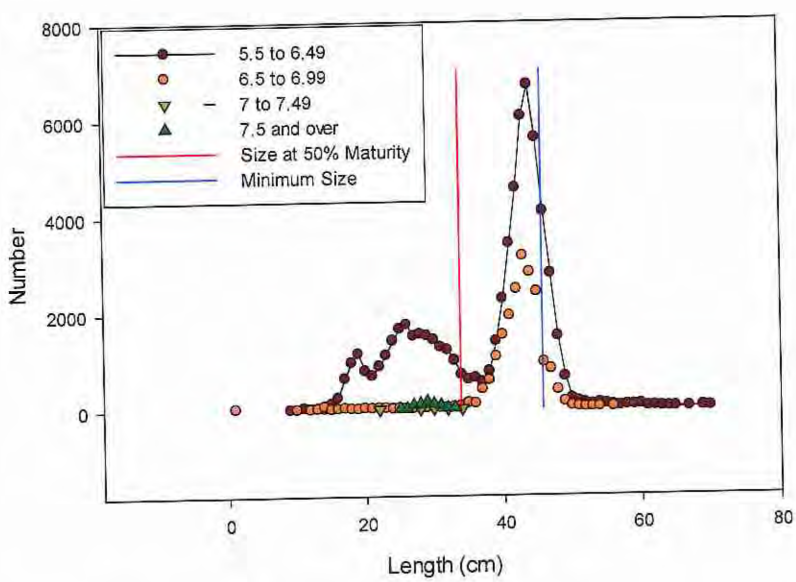


Figure 23: Observed haddock discards by mesh size.

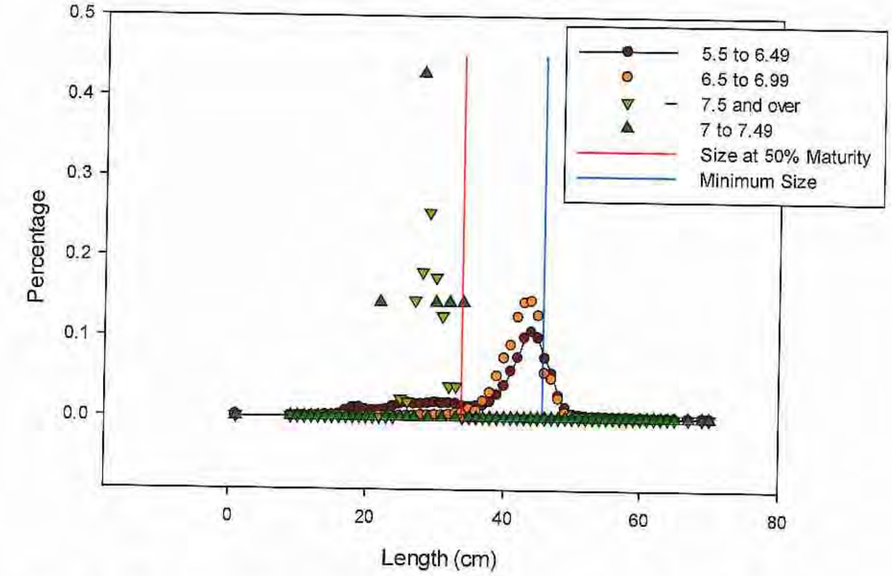


Figure 24: Proportional observed haddock discards by mesh size.

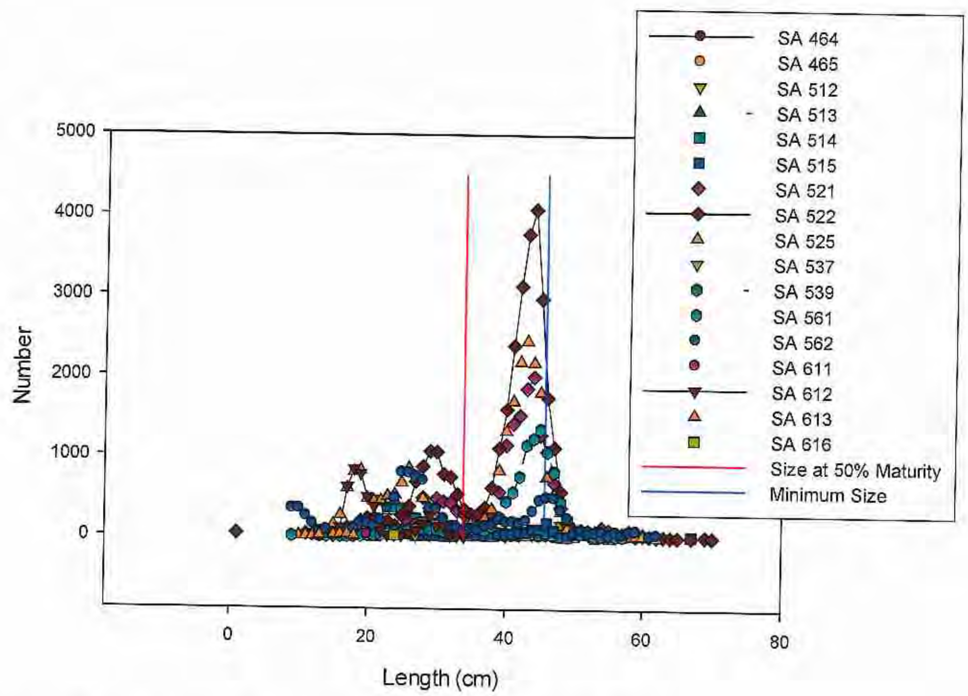


Figure 25: Observed haddock discards by statistical area.

Enclosure (1)
Groundfish PDT report dated July 27, 2012

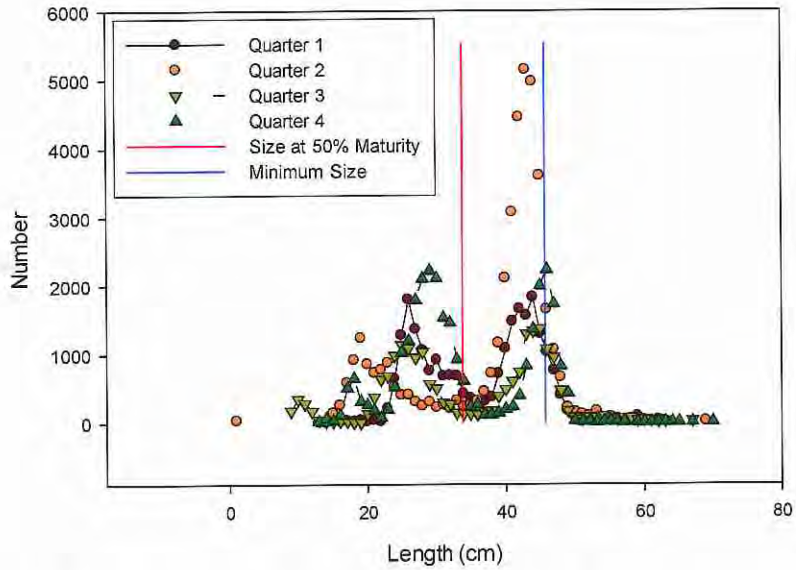


Figure 26: Observed haddock discards by quarter.

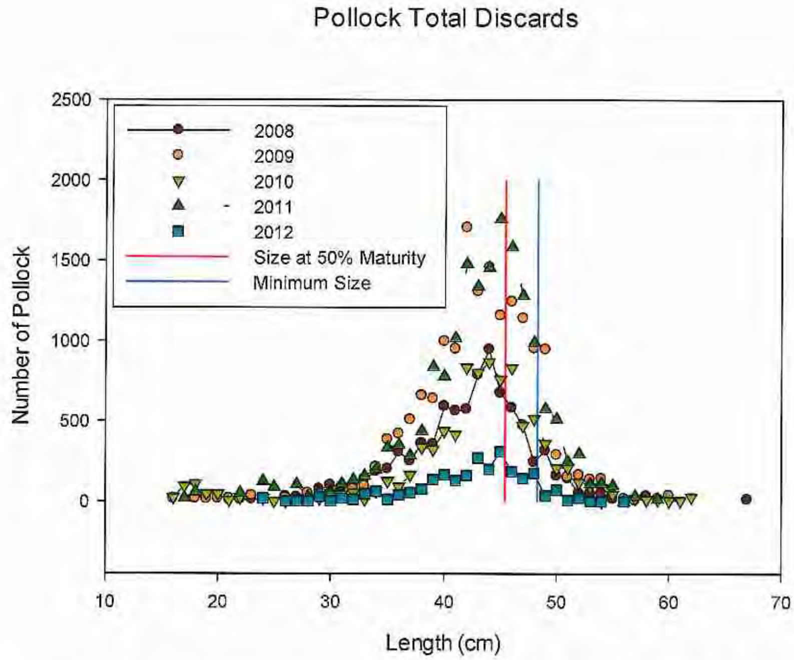


Figure 27: Total discards of pollock from ASM and NEFOP data from 2008 – 2012.

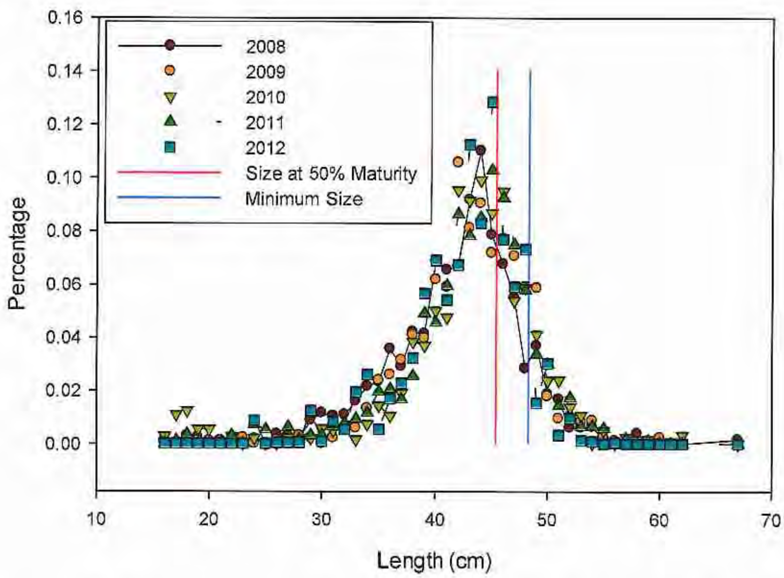


Figure 28: Proportional total discards of pollock from ASM and NEFOP data from 2008 – 2012.

Enclosure (1)
Groundfish PDT report dated July 27, 2012

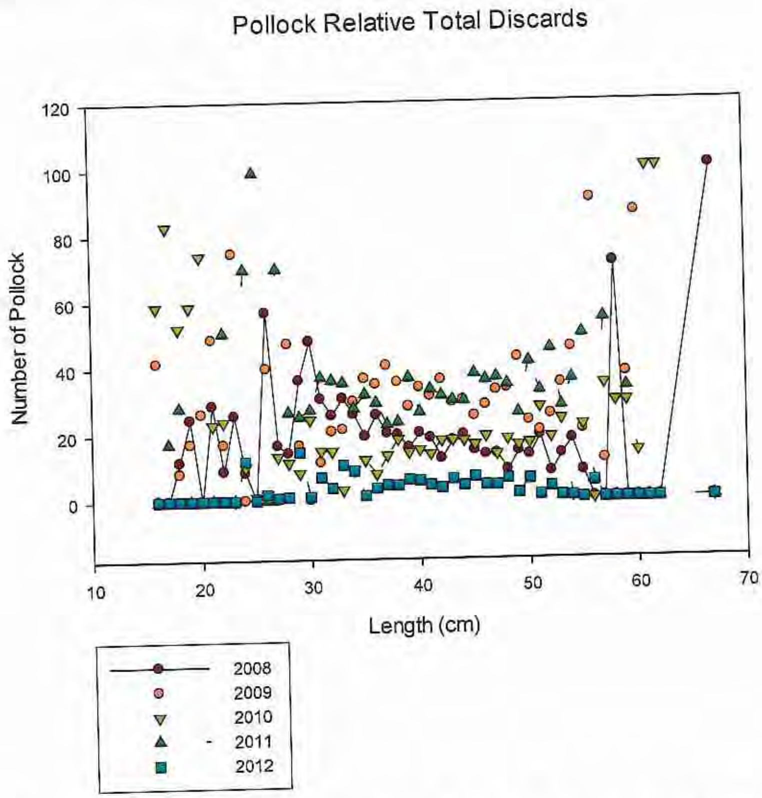


Figure 29: Relative total discards of pollock expressed as a percentage of the total.

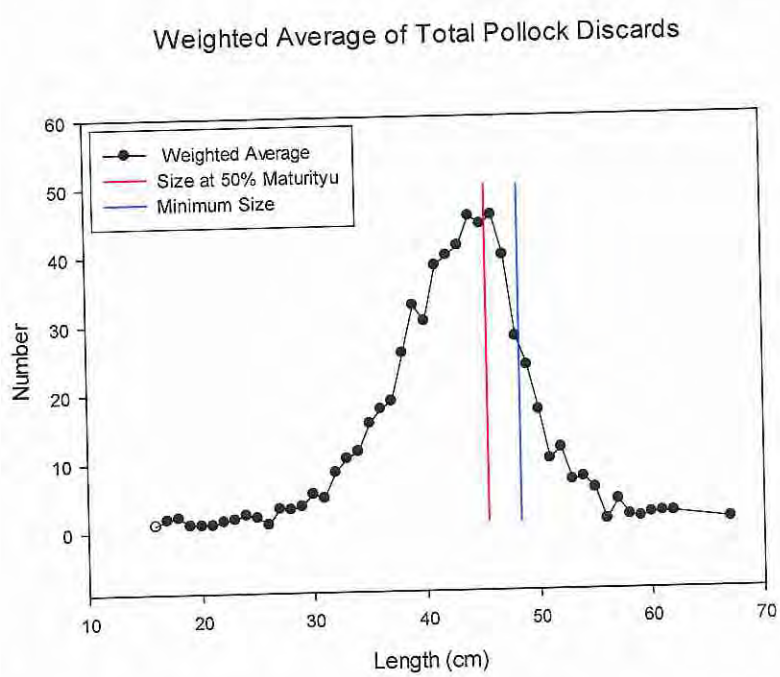


Figure 30: Weighted average total discards of pollock.

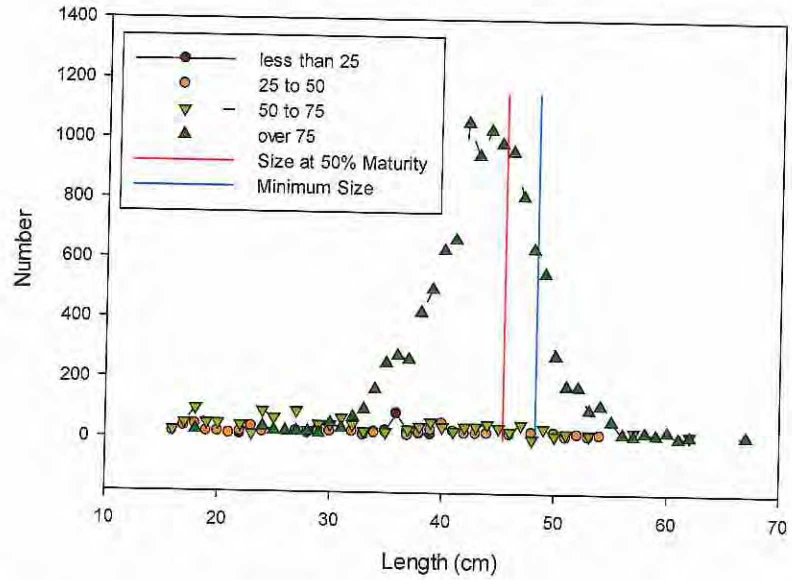


Figure 31: Observed pollock discards by depth.

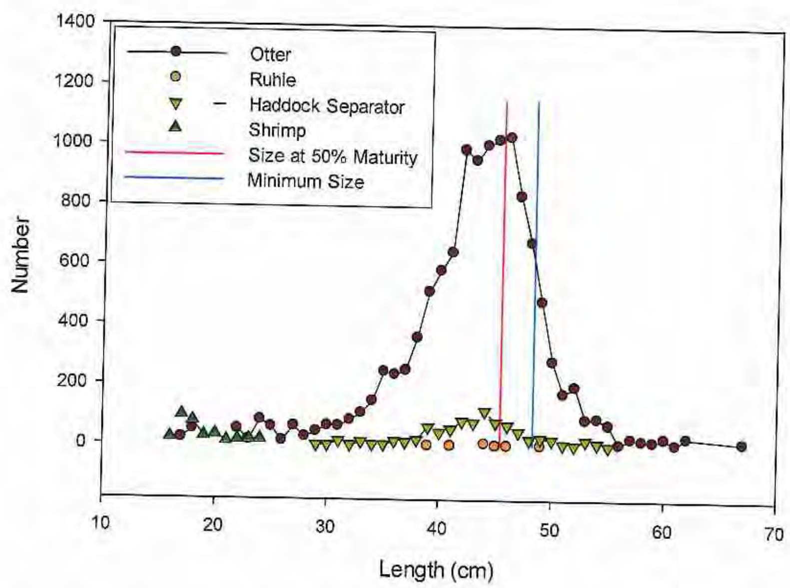


Figure 32: Observed pollock discards by gear type.

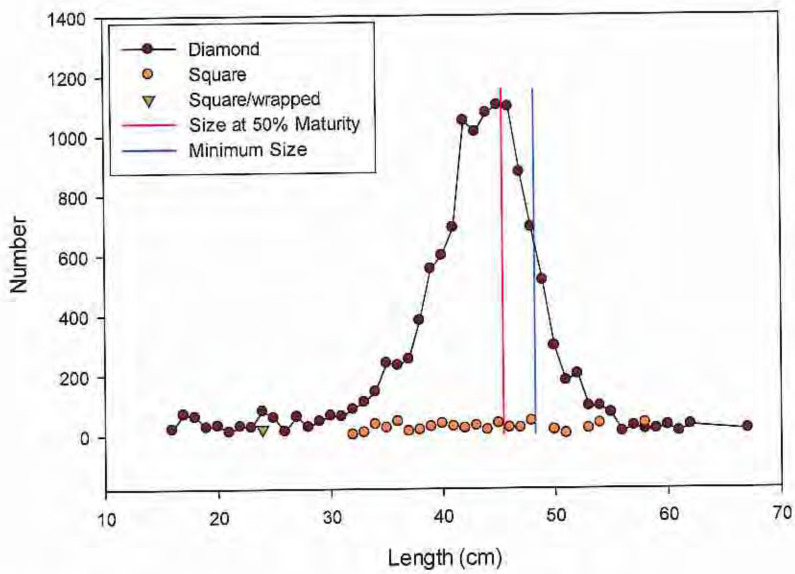


Figure 33: Observed pollock discards by mesh shape.

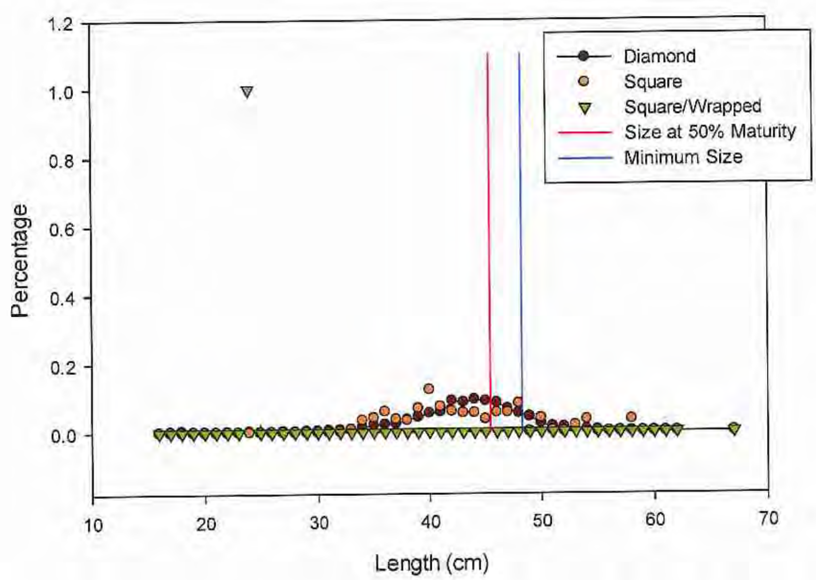


Figure 34: Proportional observed pollock discards by mesh shape.

Enclosure (1)
Groundfish PDT report dated July 27, 2012

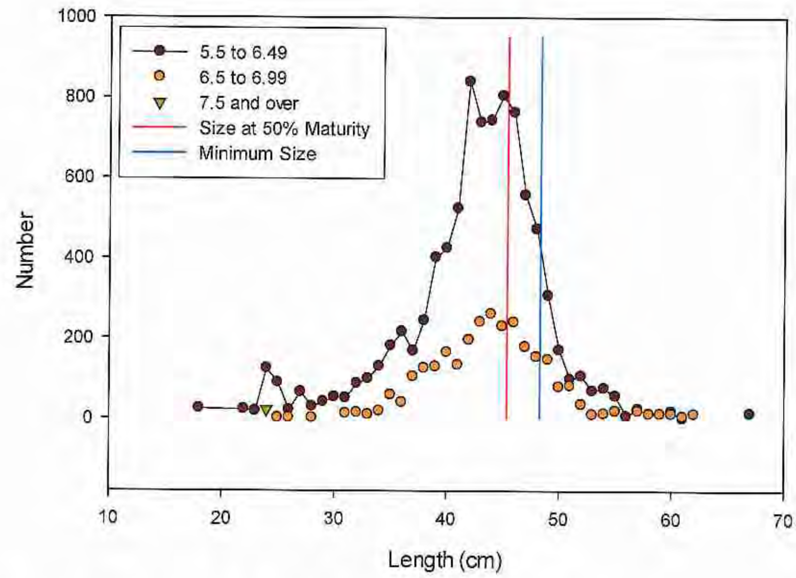


Figure 35: Observed pollock discards by mesh size.

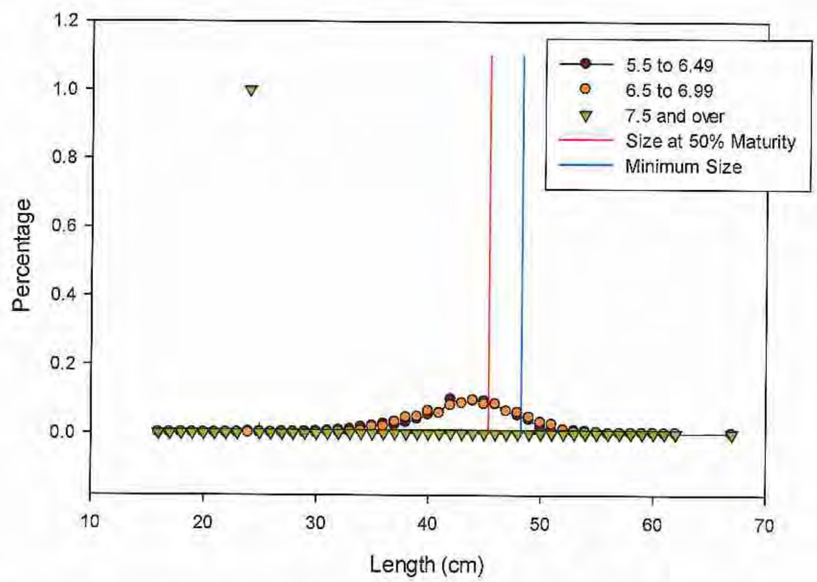


Figure 36: Proportional observed pollock discards by mesh size.

Enclosure (1)
Groundfish PDT report dated July 27, 2012

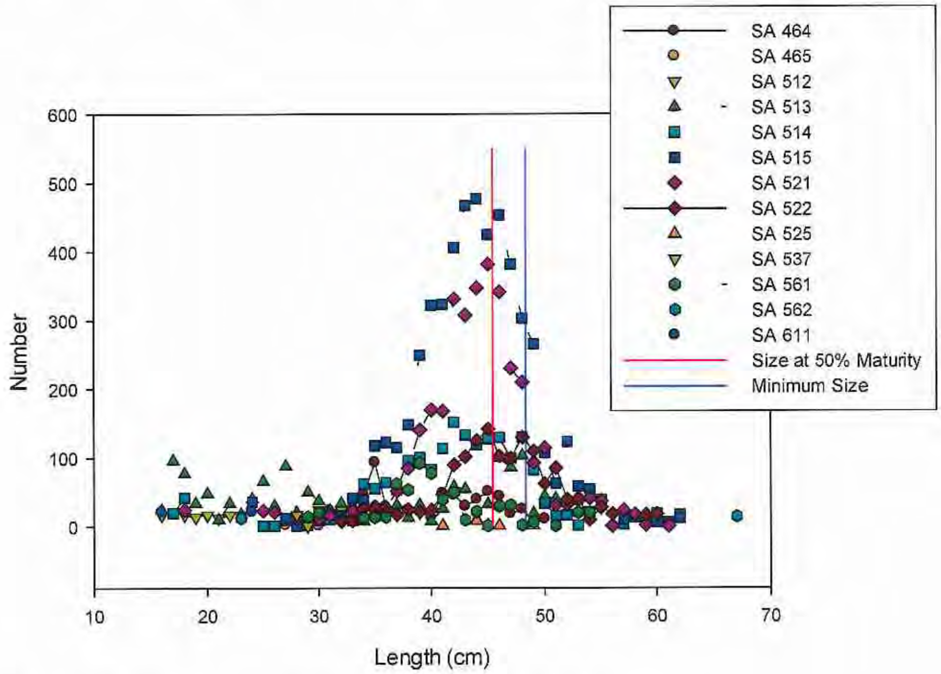


Figure 37: Observed pollock discards by statistical area.

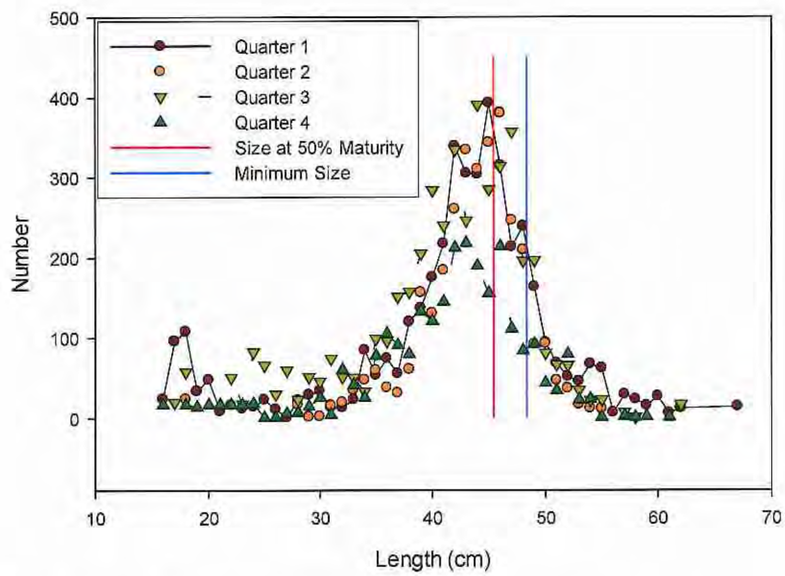


Figure 38: Observed pollock discards by quarter.

Enclosure (1)
Groundfish PDT report dated July 27, 2012

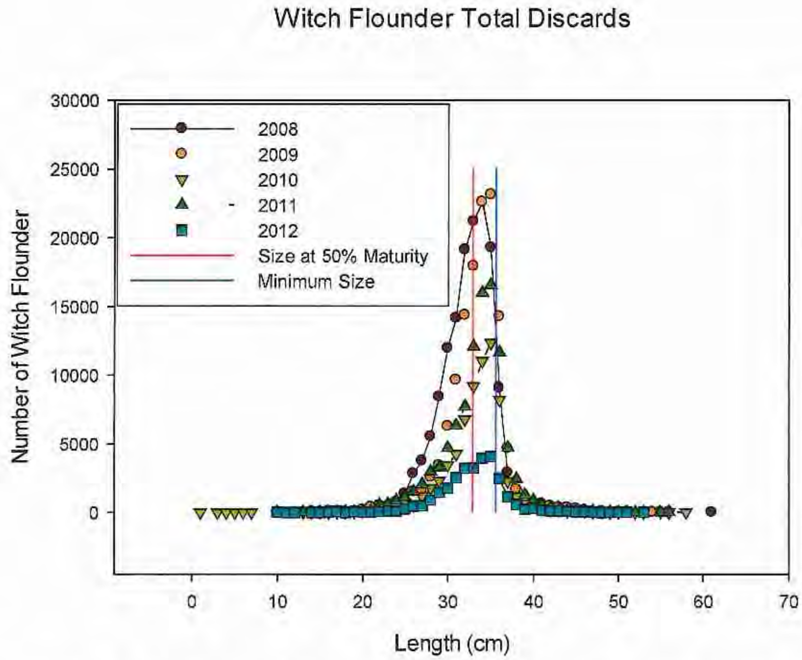


Figure 39: Total discards of witch flounder from ASM and NEFOP data from 2008 – 2012.

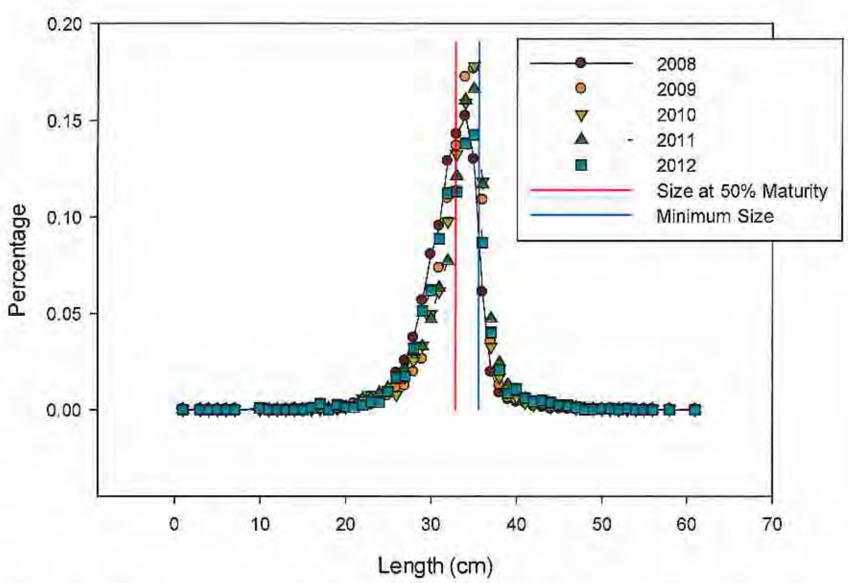


Figure 40: Proportional total discards of witch flounder from ASM and NEFOP data from 2008 – 2012.

Enclosure (1)
Groundfish PDT report dated July 27, 2012

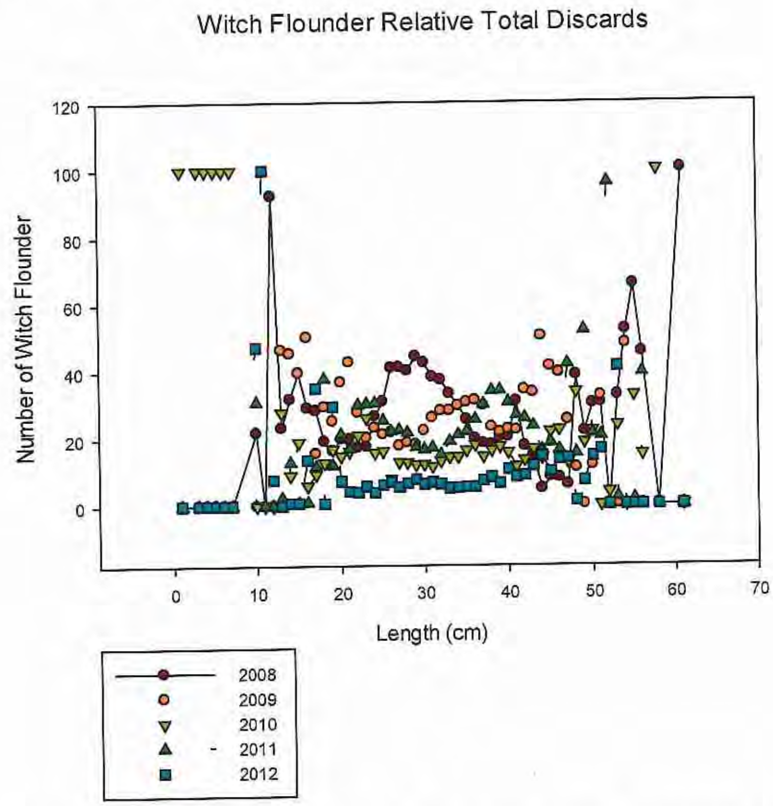


Figure 41: Relative total discards of witch flounder expressed as a percentage of the total.

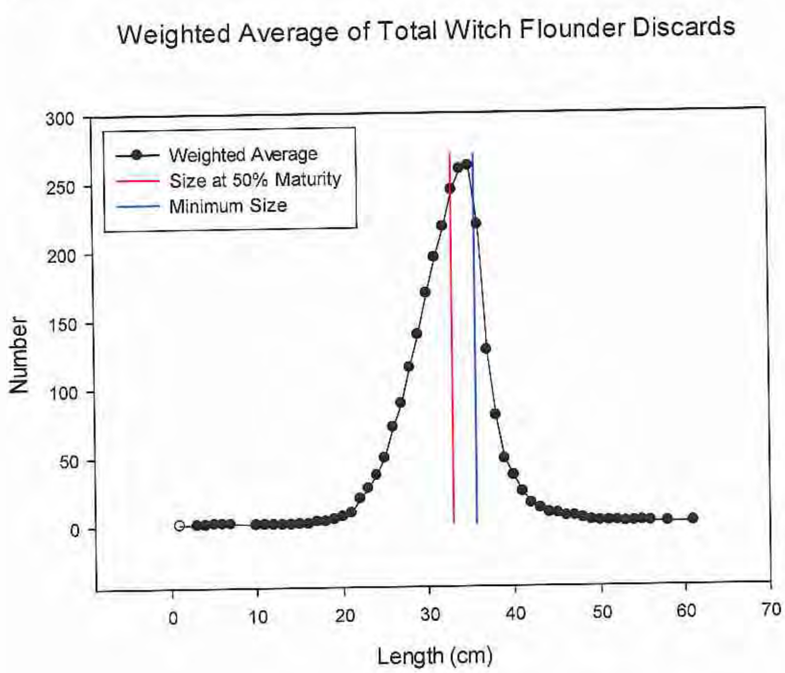


Figure 42: Weighted average total discards of witch flounder.

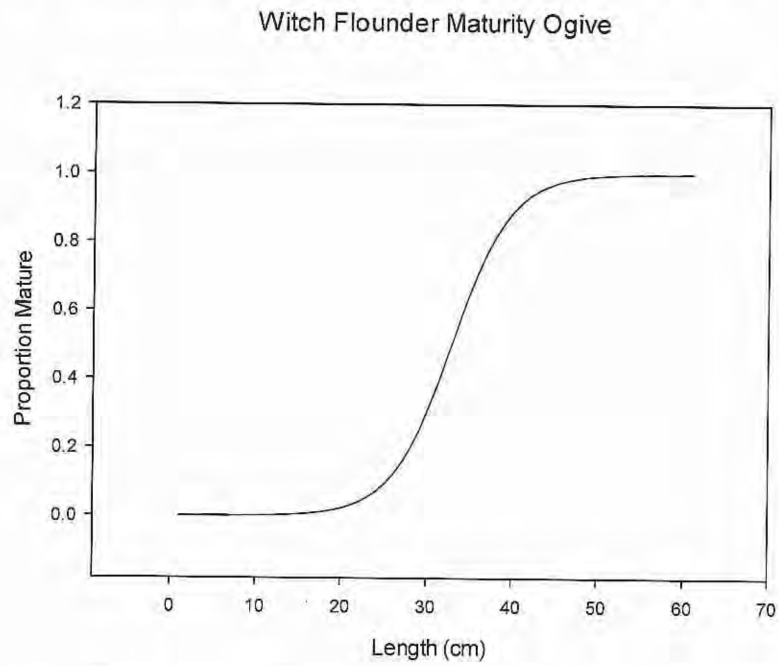


Figure 43: Maturity Ogive for witch flounder.

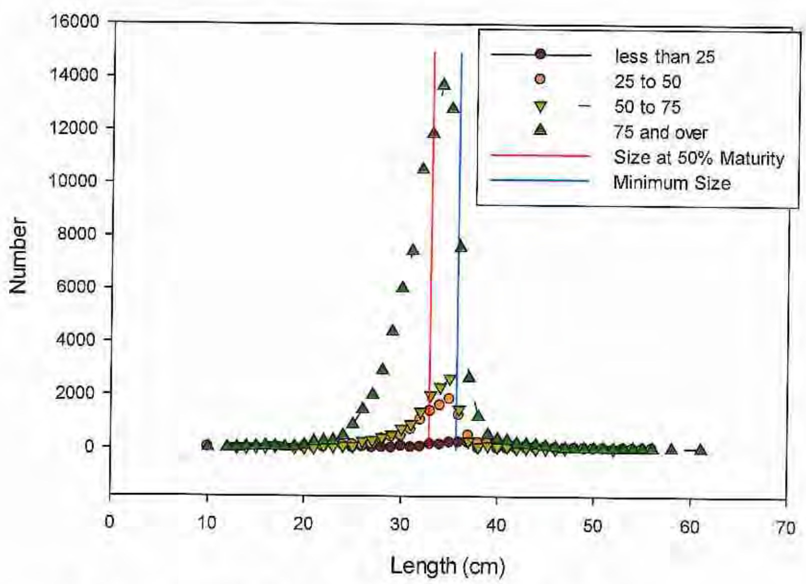


Figure 44: Observed witch flounder discards by depth.

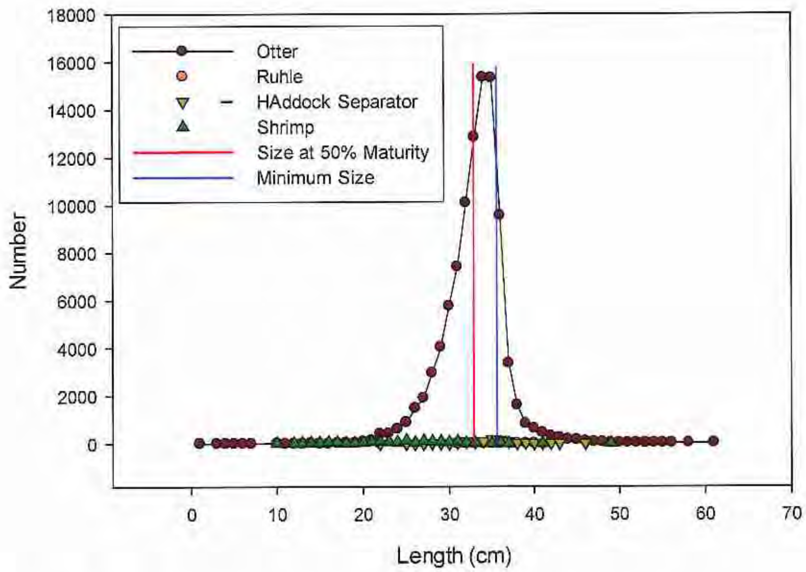


Figure 45: Observed witch flounder discards by gear type.

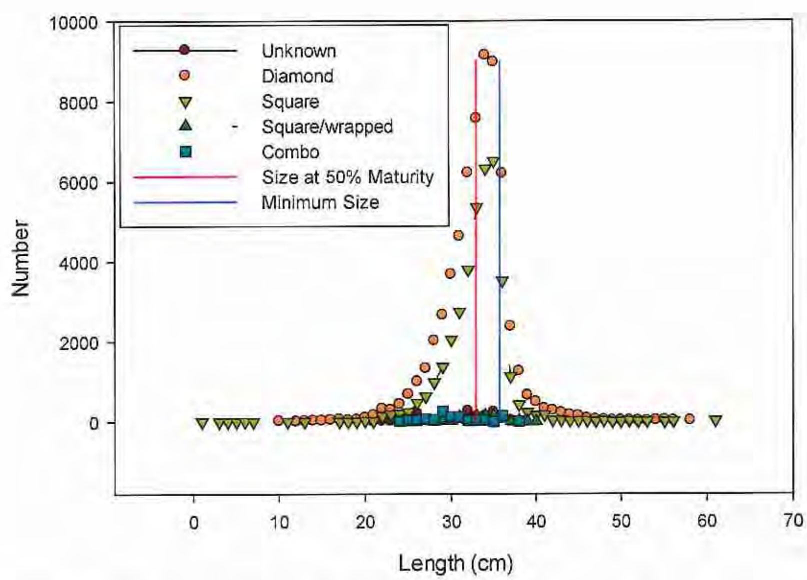


Figure 46: Observed witch flounder discards by mesh shape.

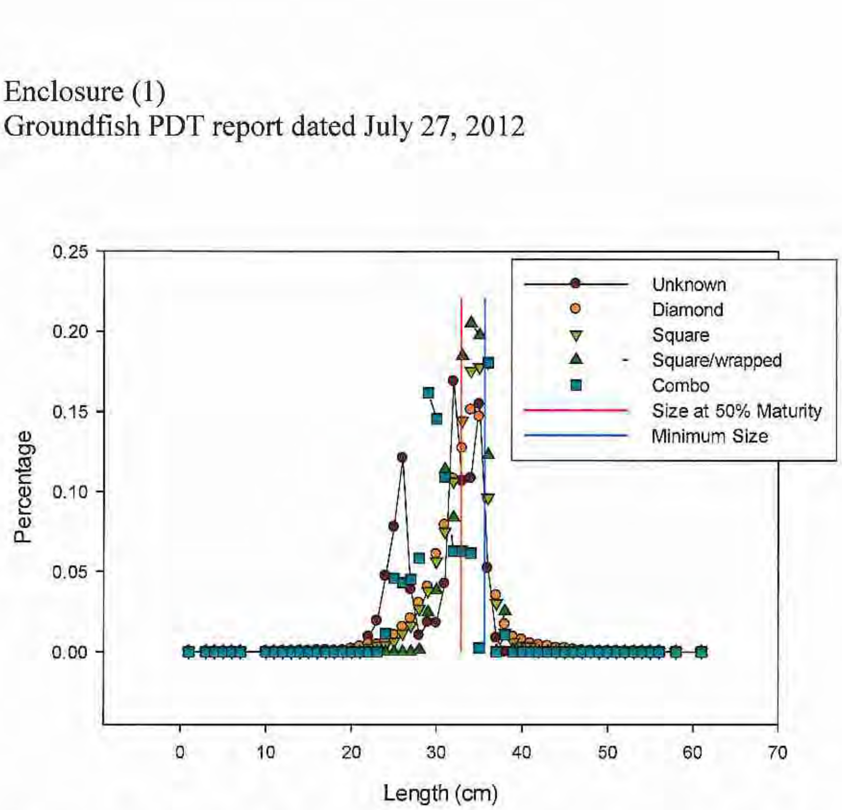


Figure 47: Proportional observed witch flounder discards by mesh shape.

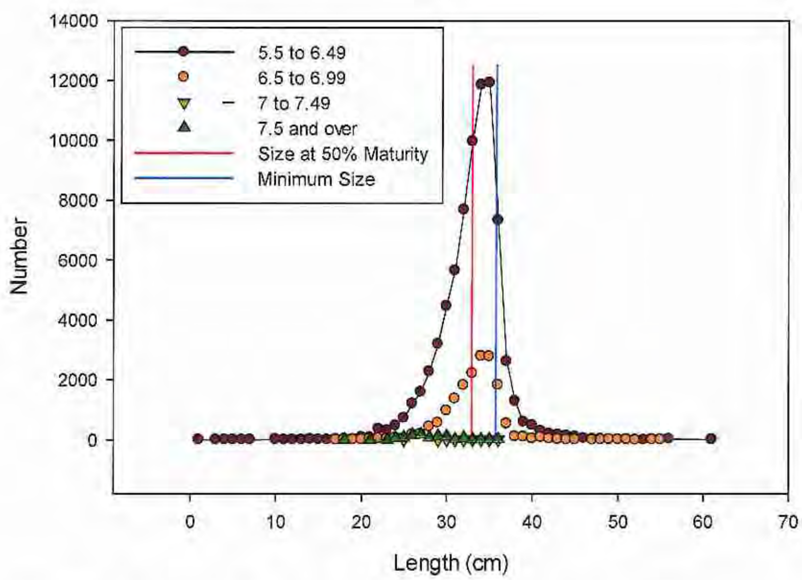


Figure 48: Observed witch flounder discards by mesh size.

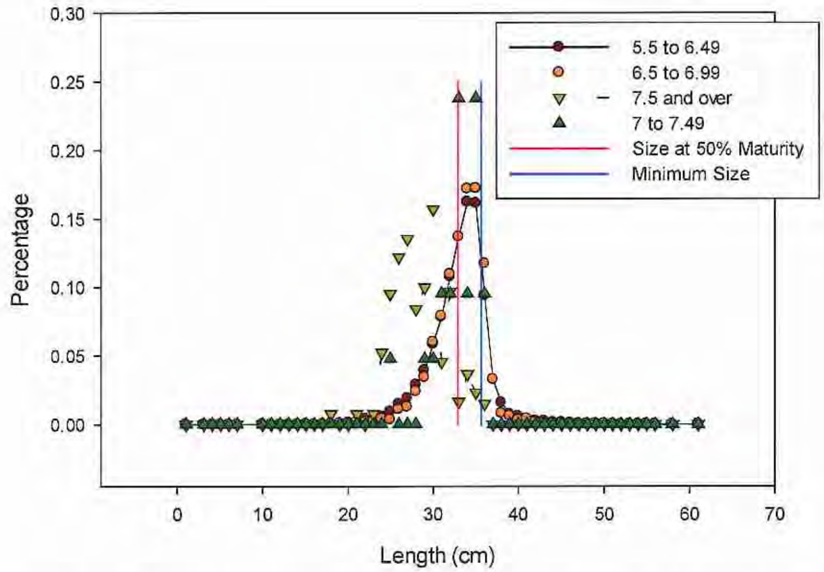


Figure 49: Proportional observed witch flounder discards by mesh size.

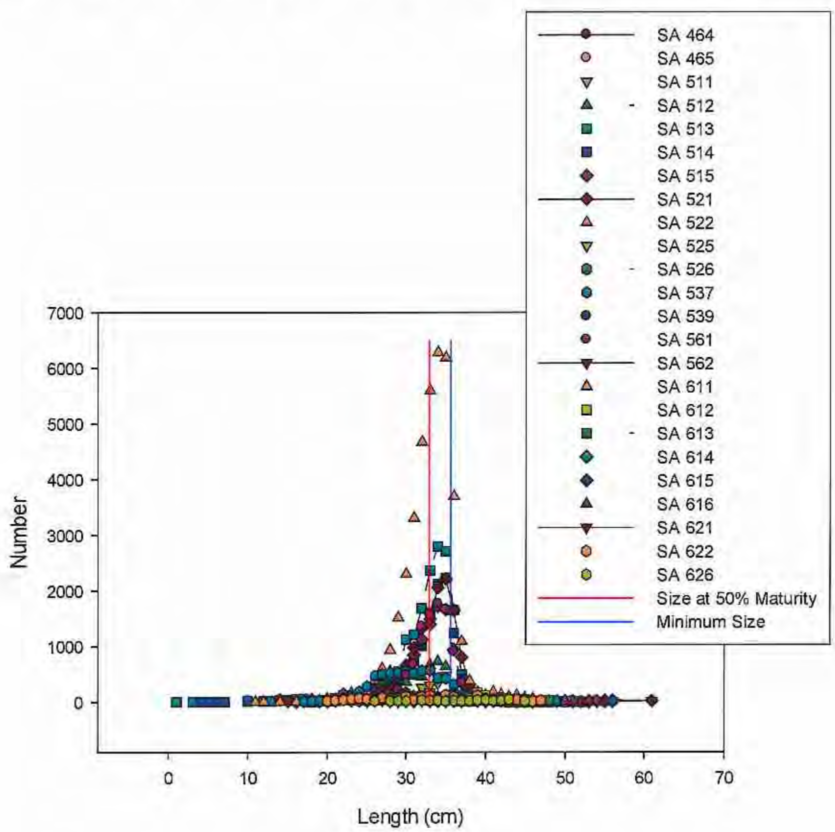


Figure 50: Observed witch flounder discards by statistical area.

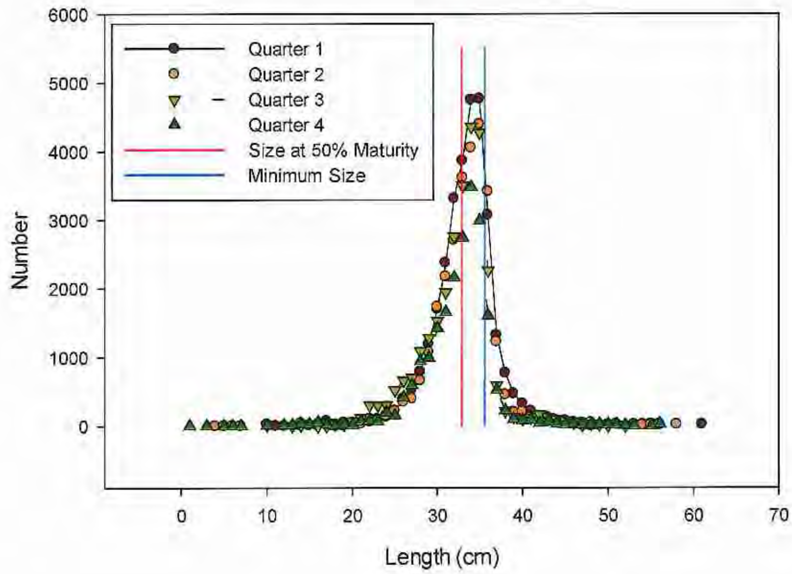


Figure 51: Observed witch flounder discards by quarter.

Yellowtail Flounder Total Discards

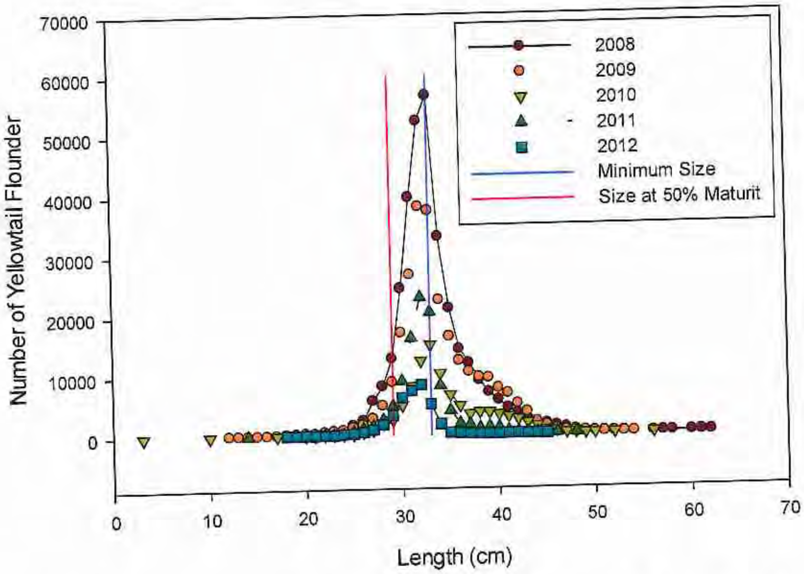


Figure 52: Total discards of yellowtail flounder from ASM and NEFOP data from 2008 – 2012.

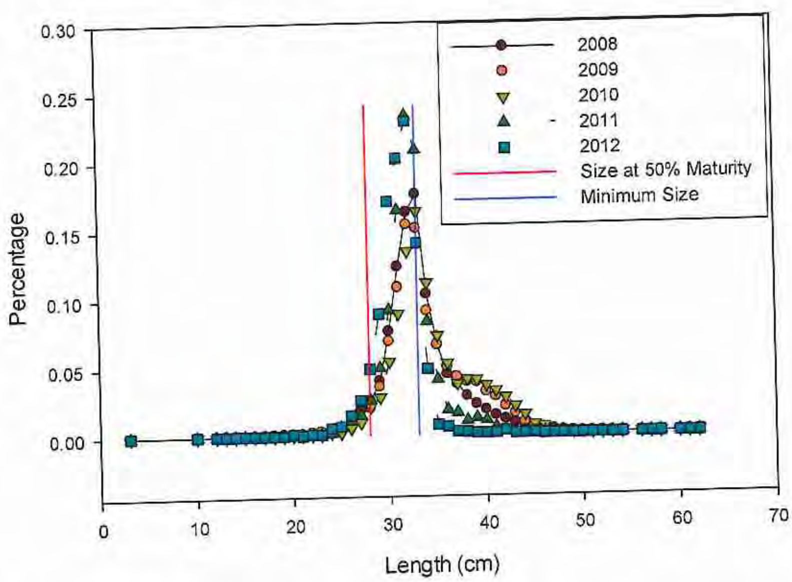


Figure 53: Proportional discards of yellowtail flounder from ASM and NEFOP data from 2008 – 2012.

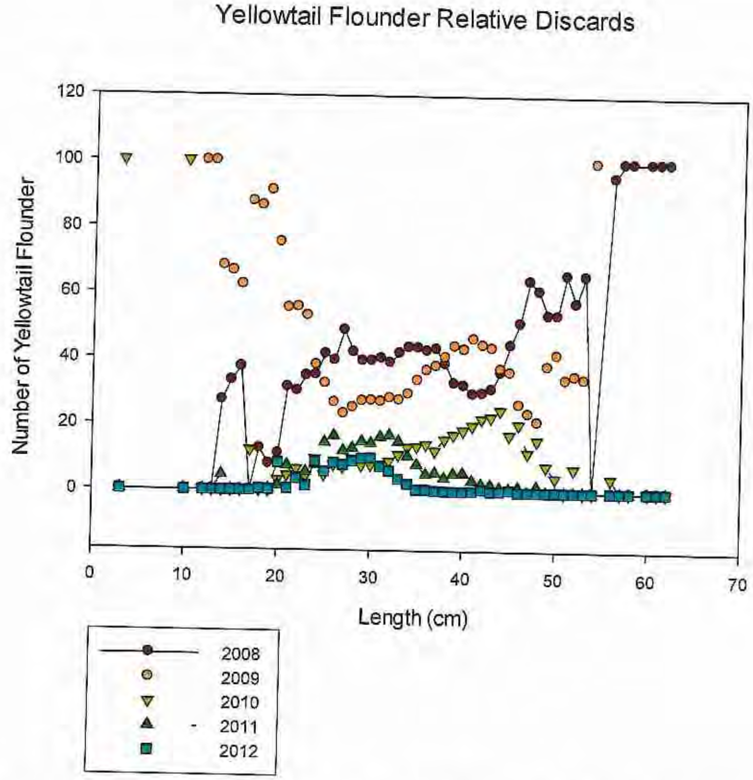


Figure 54: Relative total discards of yellowtail flounder expressed as a percentage of the total.

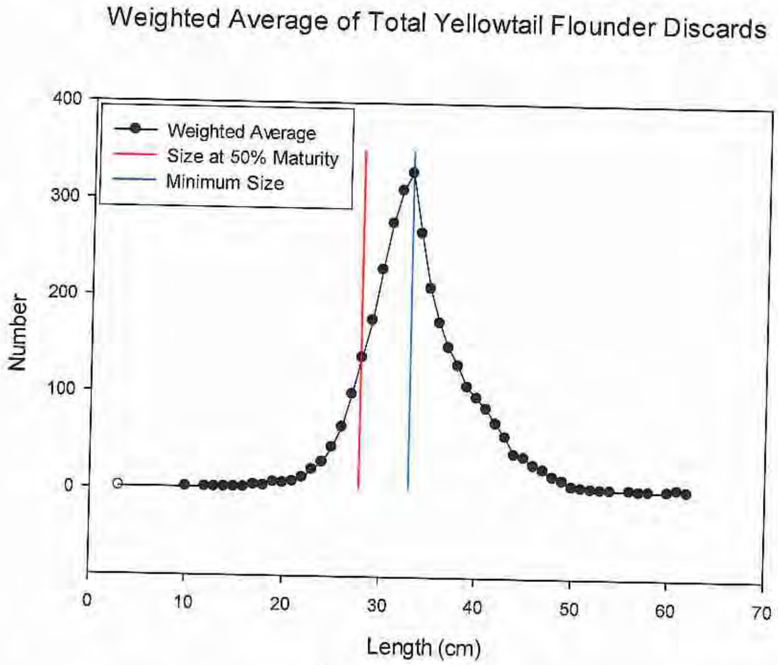


Figure 55: Weighted average total discards of yellowtail flounder.

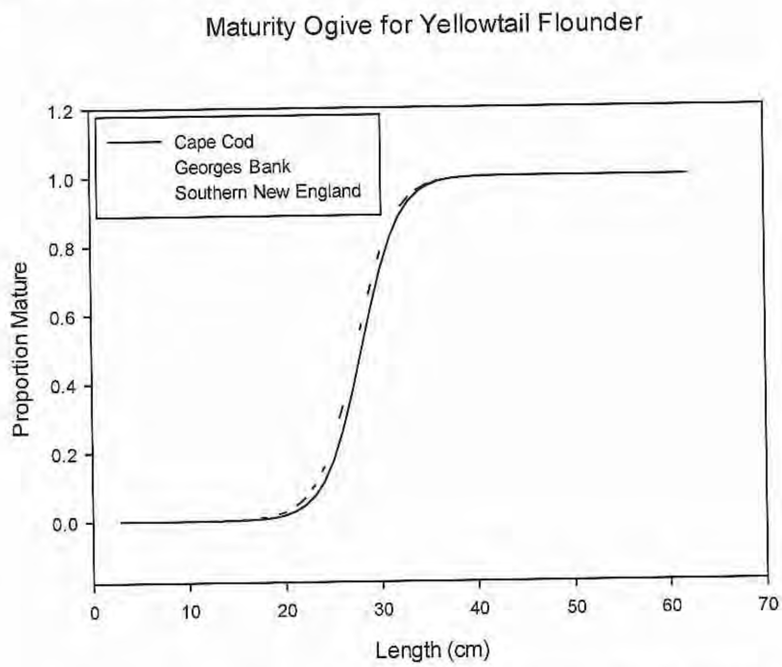


Figure 56: Maturity Ogive for Cape Cod, Georges Bank and Southern New England yellowtail flounder.

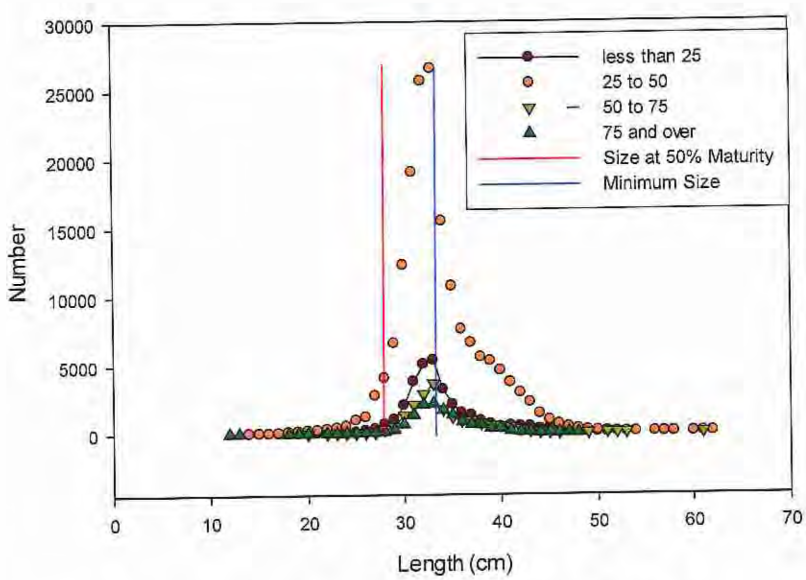


Figure 57: Observed yellowtail flounder discards by depth.

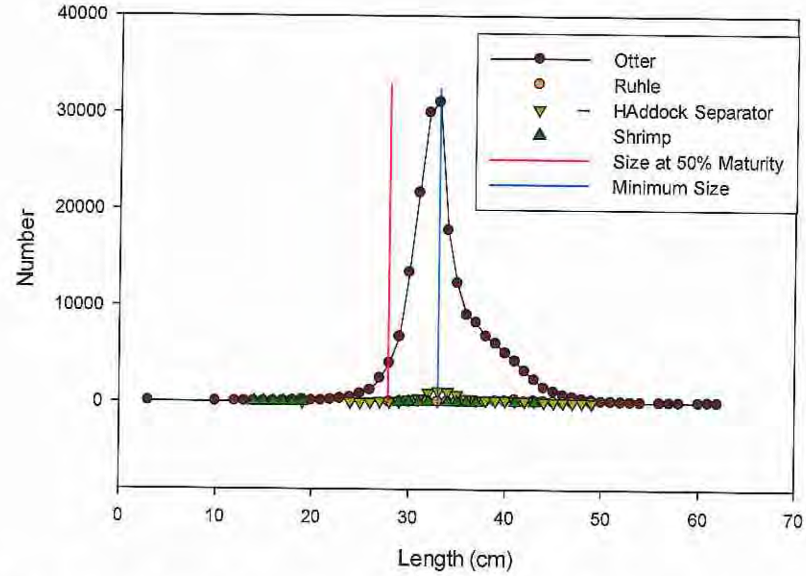


Figure 58: Observed yellowtail flounder discards by gear type.

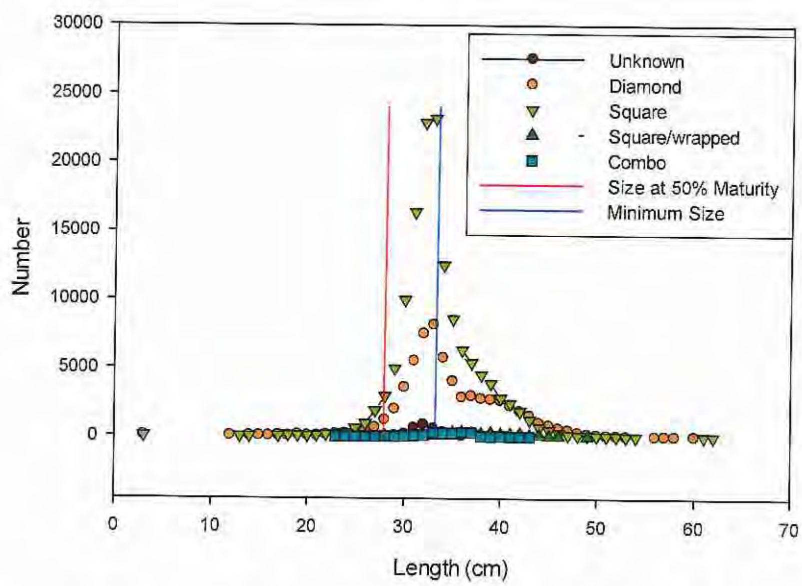


Figure 59: Observed yellowtail flounder discards by mesh shape.

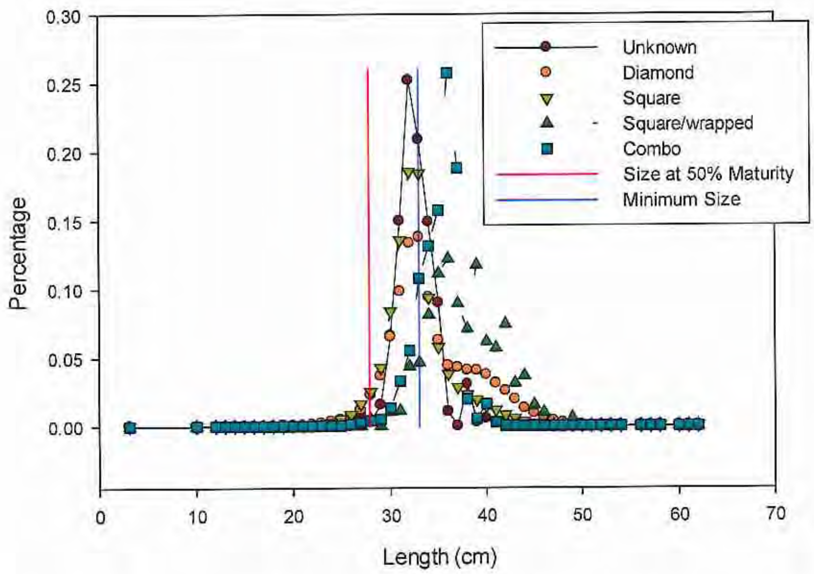


Figure 60: Proportional observed yellowtail flounder discards by mesh shape.

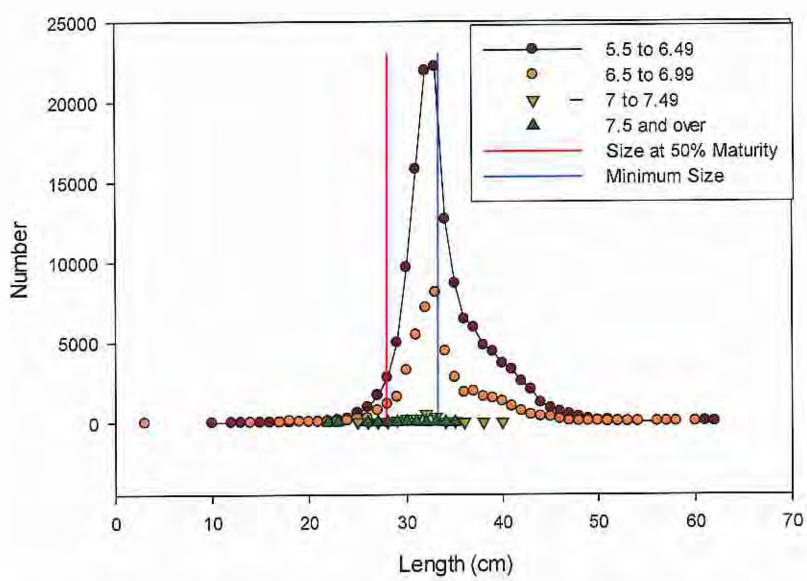


Figure 61: Observed yellowtail flounder discards by mesh size.

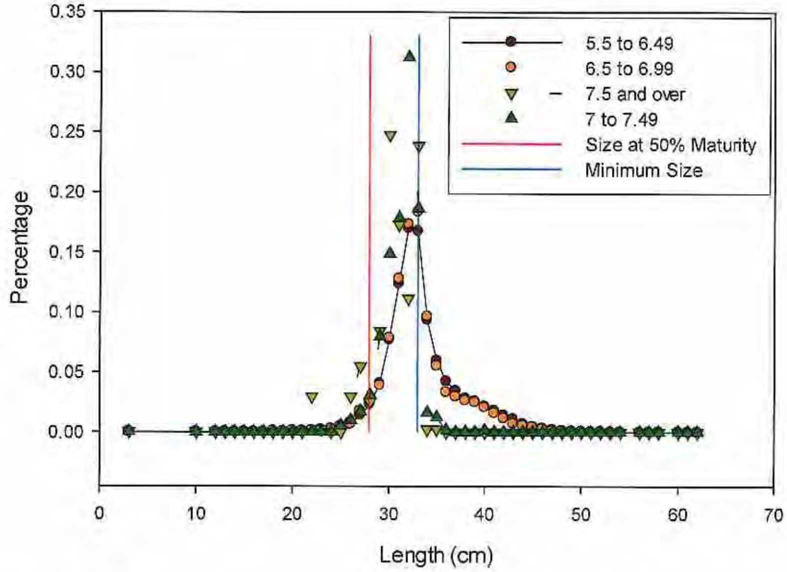


Figure 62: Proportional observed yellowtail flounder discards by mesh size.

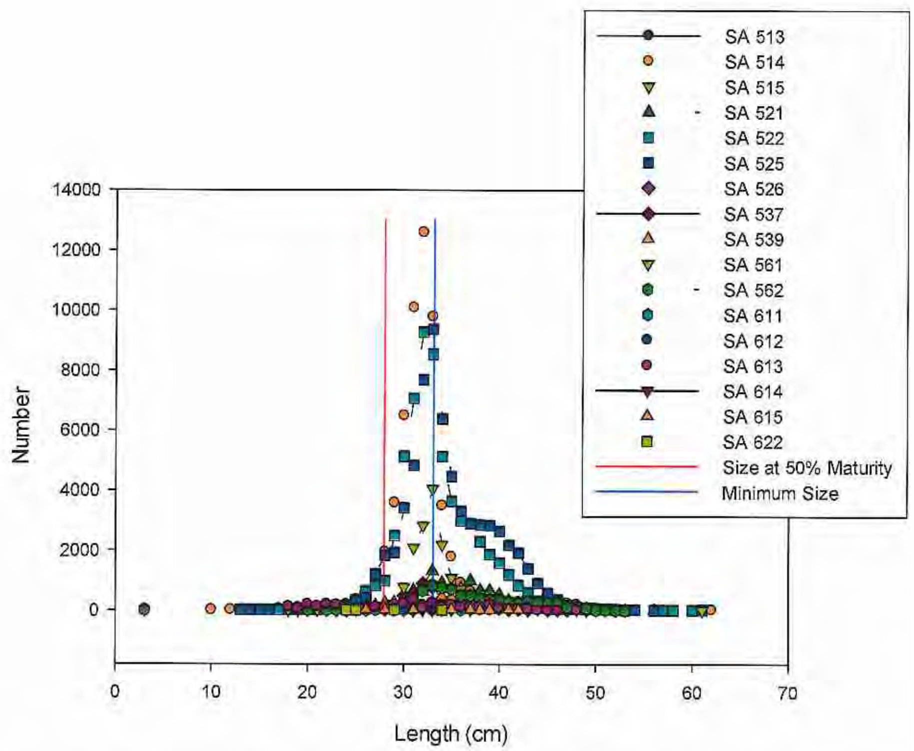


Figure 63: Observed yellowtail flounder discards by statistical area.

Enclosure (1)
Groundfish PDT report dated July 27, 2012

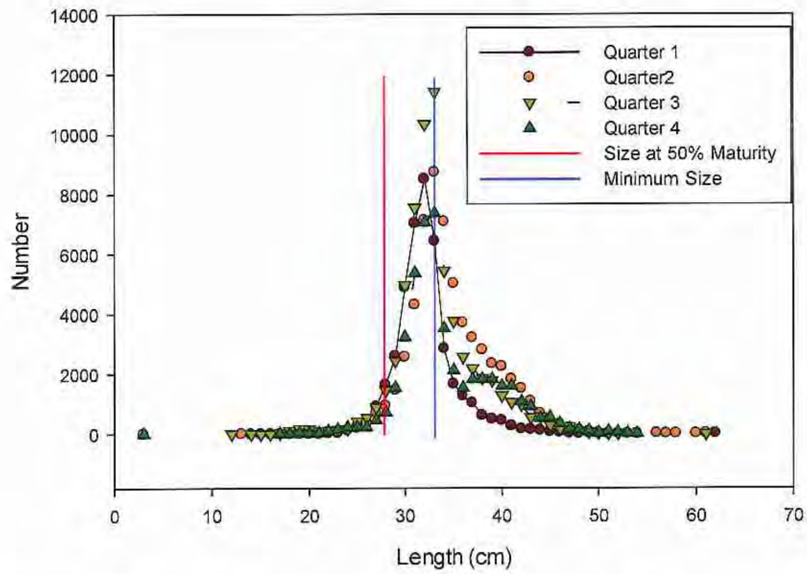


Figure 64: Observed yellowtail flounder discards by quarter.

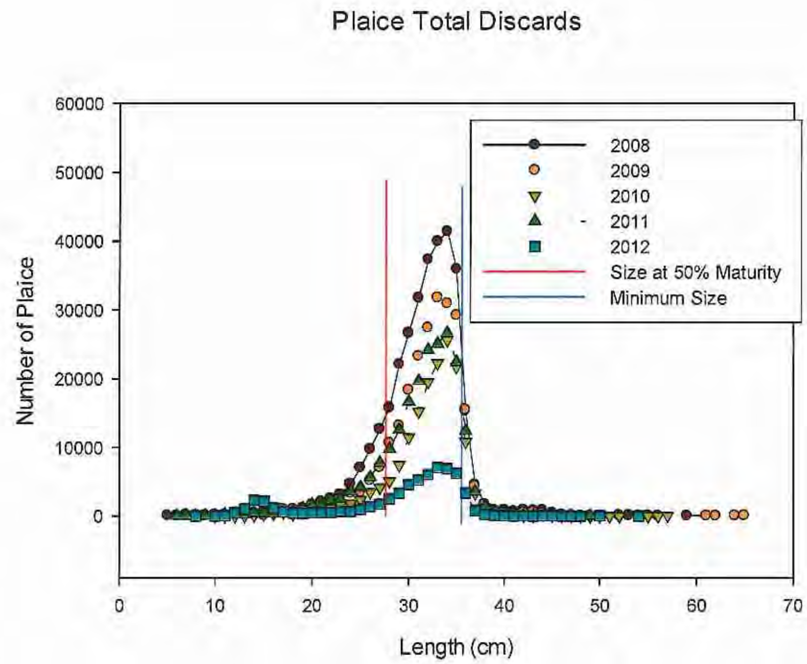


Figure 65: Total discards of plaice from ASM and NEFOP data from 2008 – 2012.

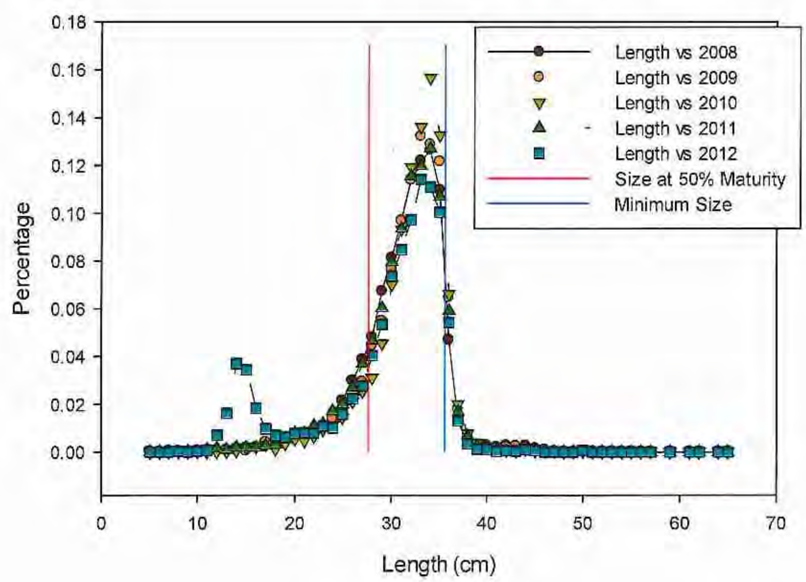


Figure 66: Proportional total discards of plaice from ASM and NEFOP data from 2008 – 2012.

Enclosure (1)
Groundfish PDT report dated July 27, 2012

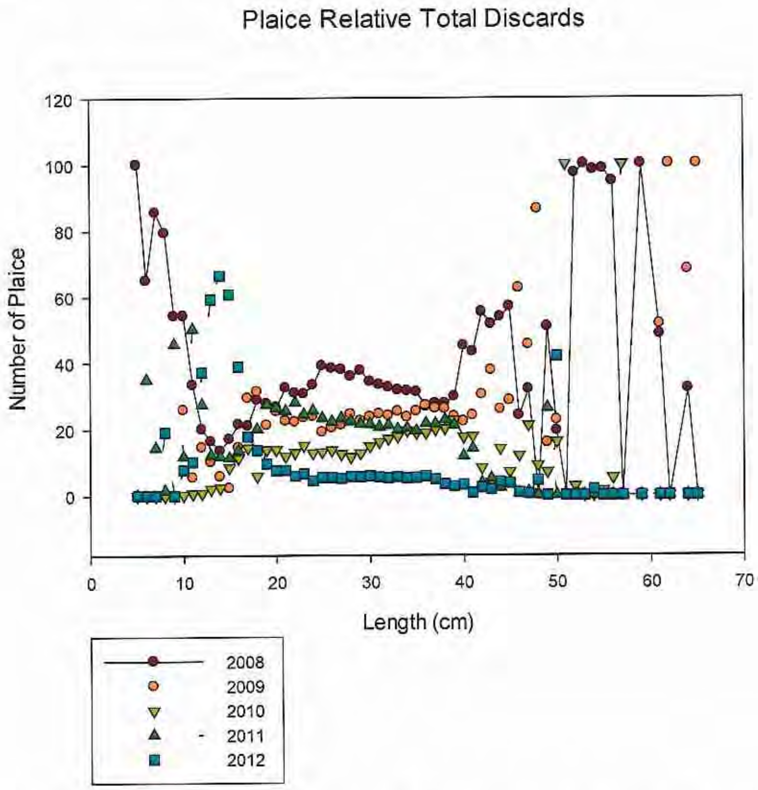


Figure 67: Relative total discards of plaice expressed as a percentage of the total.

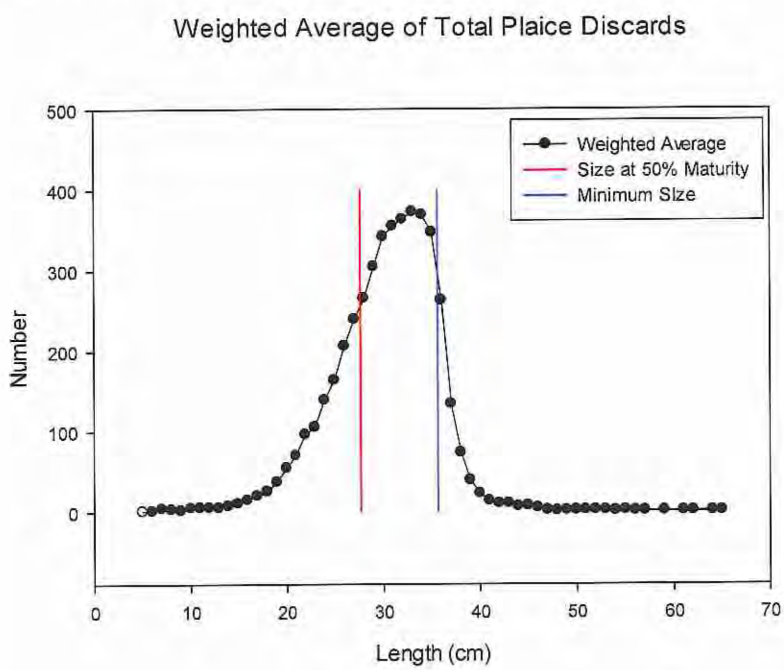


Figure 68: Weighted average total discards of plaice.

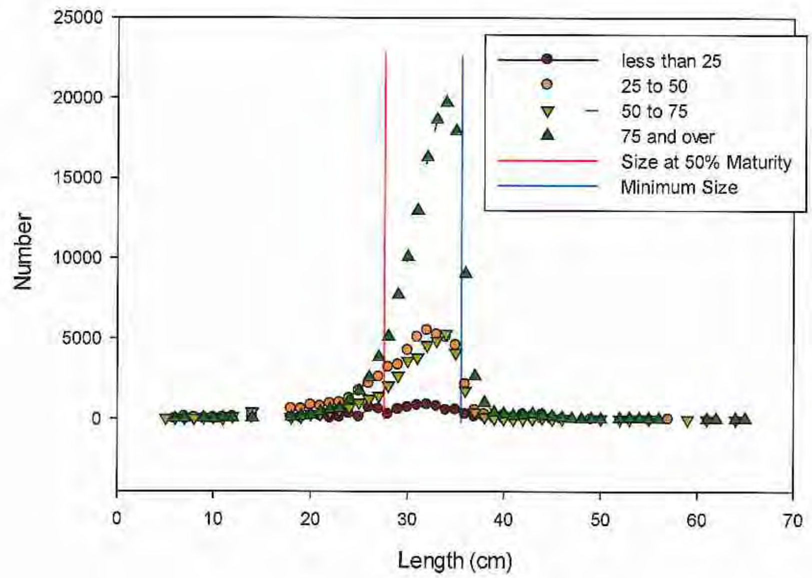


Figure 69: Observed plaice discards by depth.

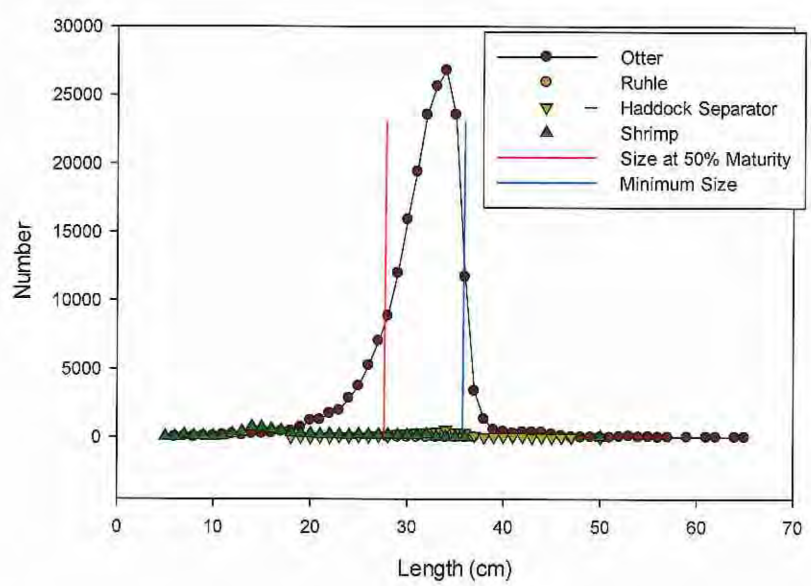


Figure 70: Observed plaice discards by gear type.

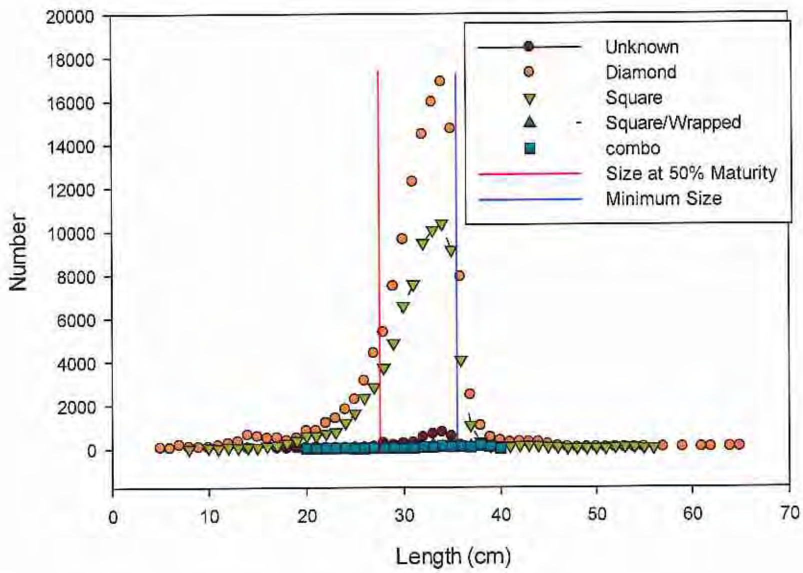


Figure 71: Observed plaice discards by mesh shape.

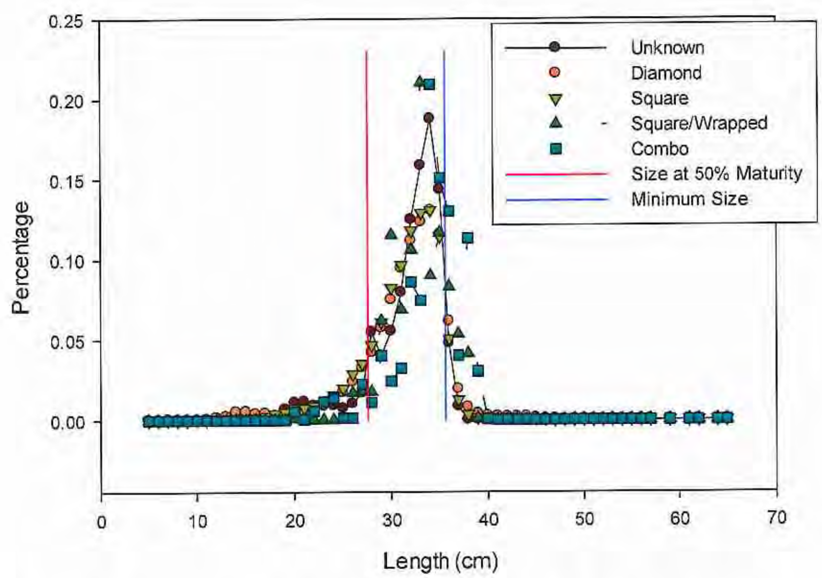


Figure 72: Proportional observed plaice discards by mesh shape.

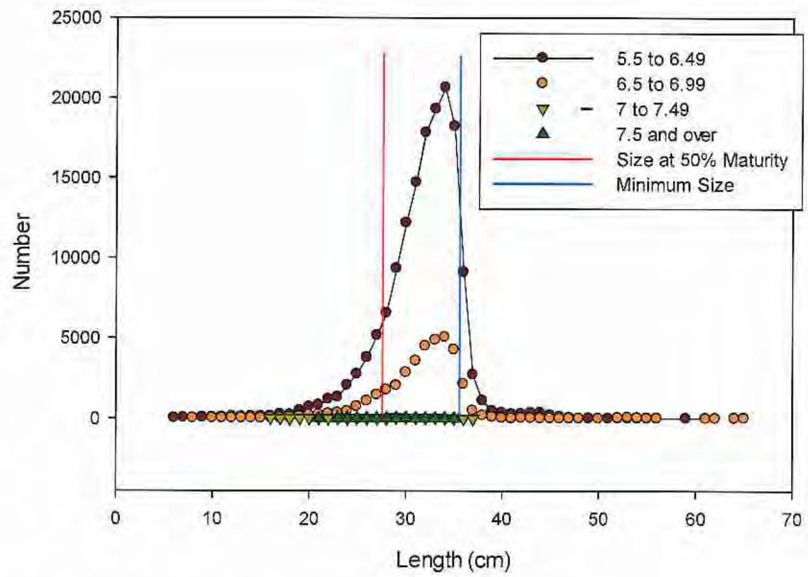


Figure 73: Observed plaice discards by mesh size.

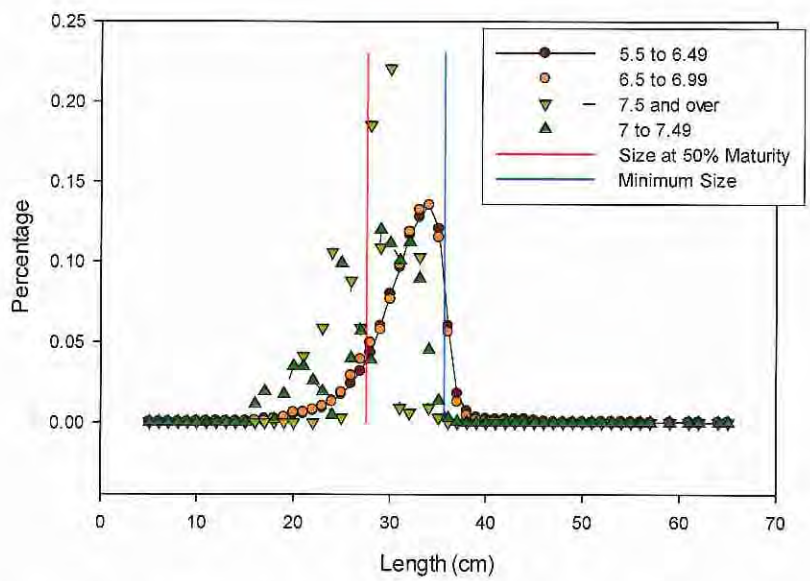


Figure 74: Proportional observed plaice discards by mesh size.

Enclosure (1)
Groundfish PDT report dated July 27, 2012

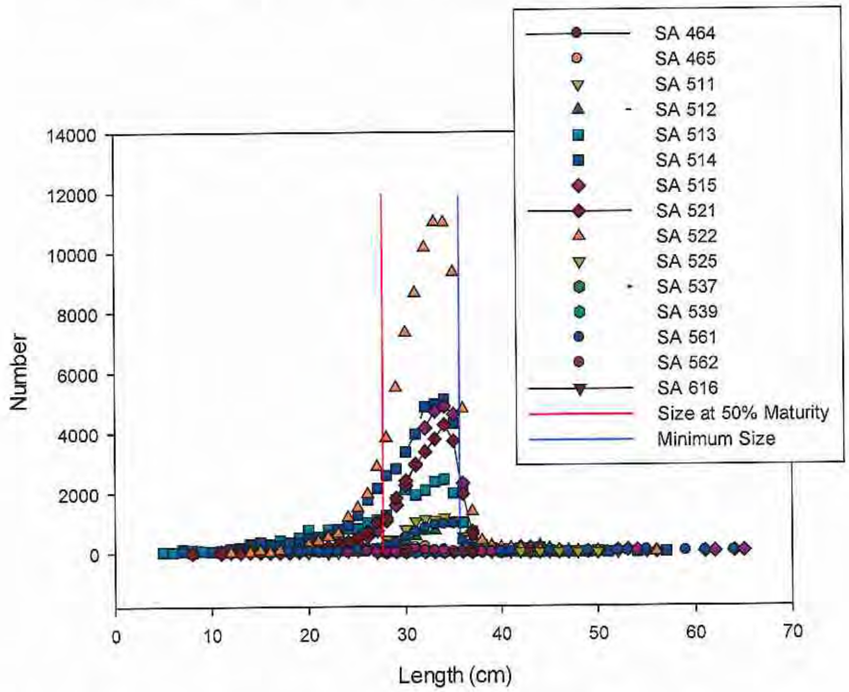


Figure 75: Observed plaice discards by statistical area.

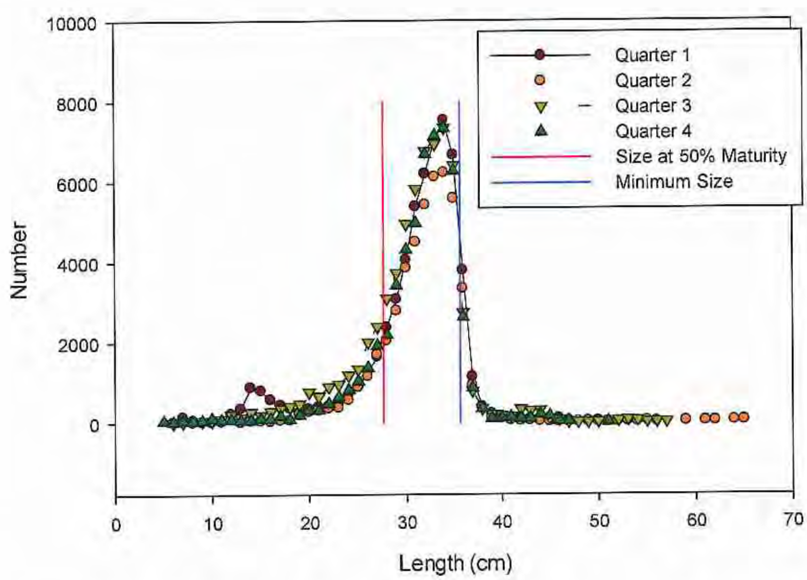


Figure 76: Observed plaice discards by quarter.

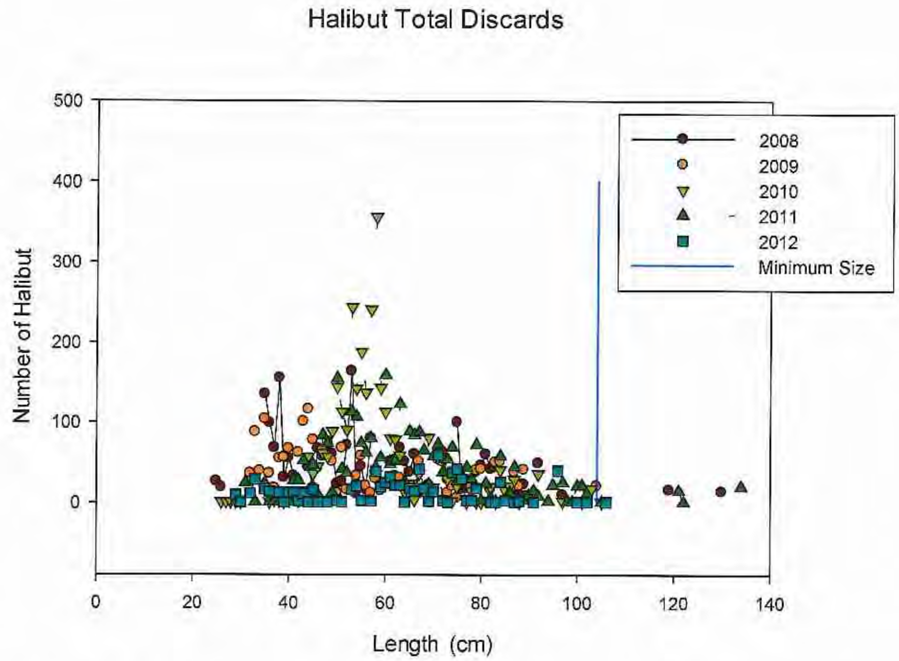


Figure 77: Total discards of halibut from ASM and NEFOP data from 2008 – 2012.

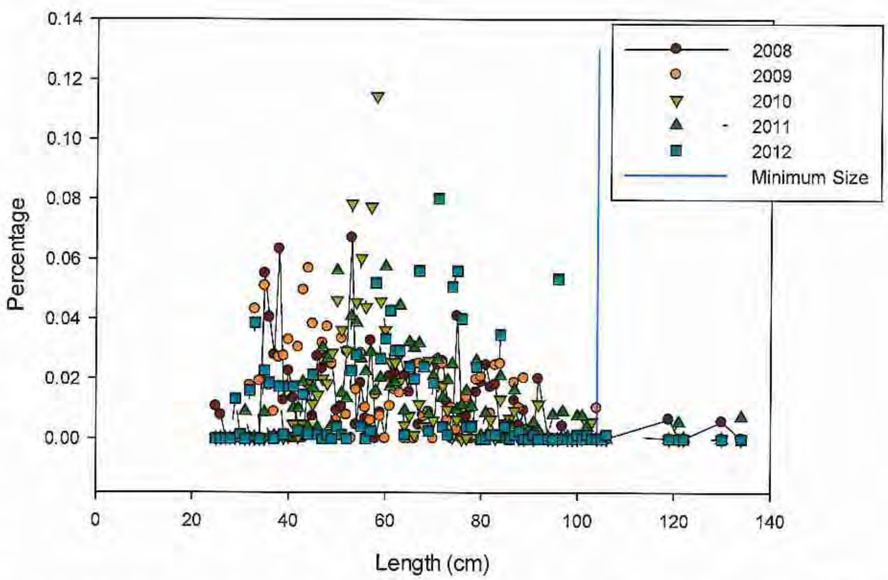


Figure 78: Proportional total discards of halibut from ASM and NEFOP data from 2008 – 2012.

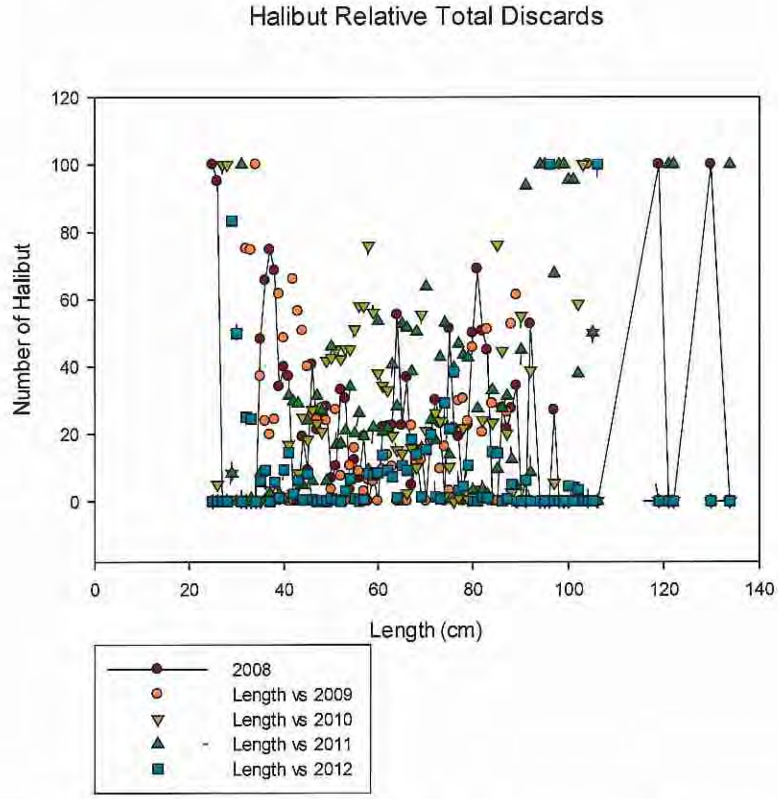


Figure 79: Relative total discards of halibut expressed as a percentage of the total.

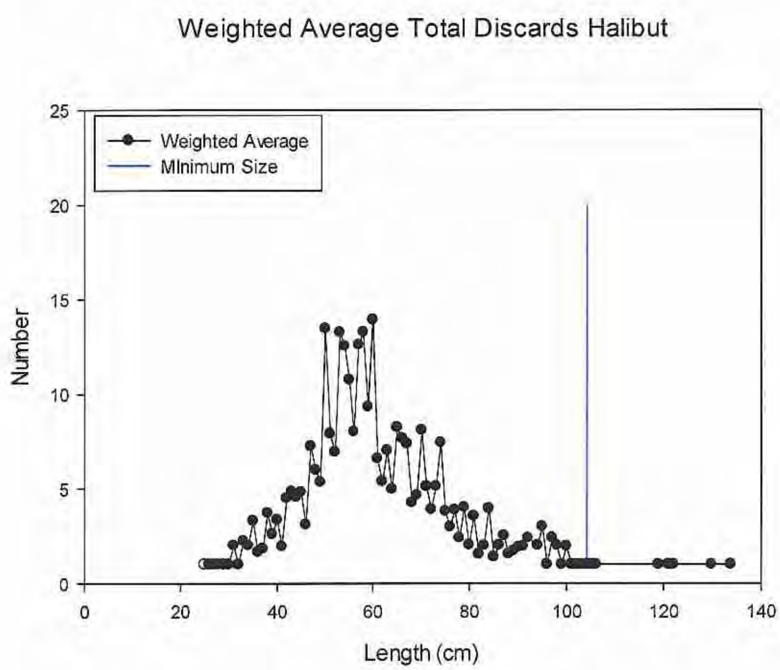


Figure 80: Weighted average total discards of halibut.

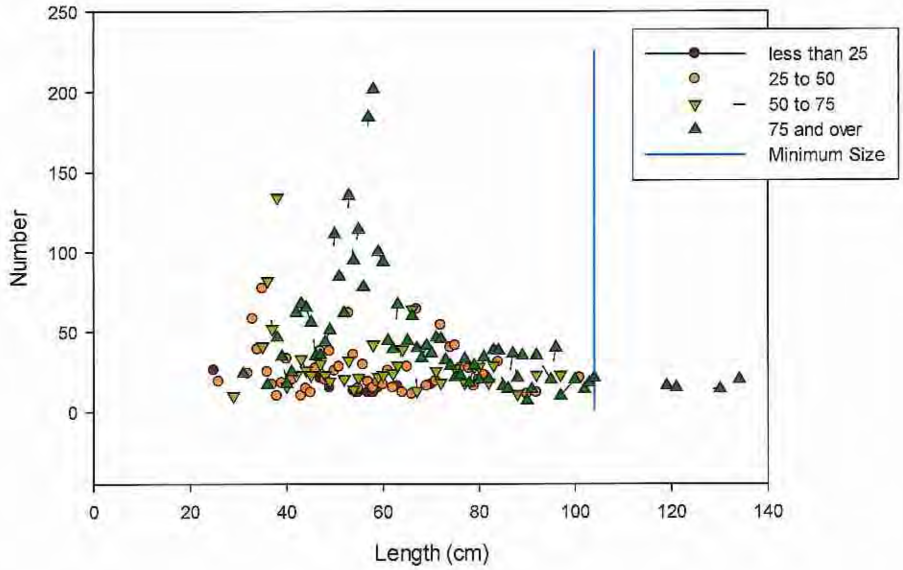


Figure 81: Observed halibut discards by depth.

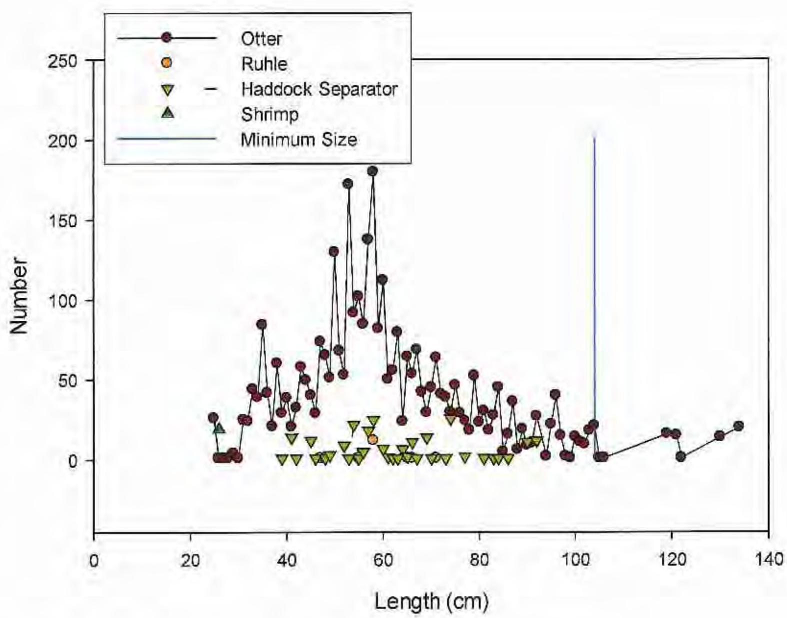


Figure 82: Observed halibut discards by gear type.

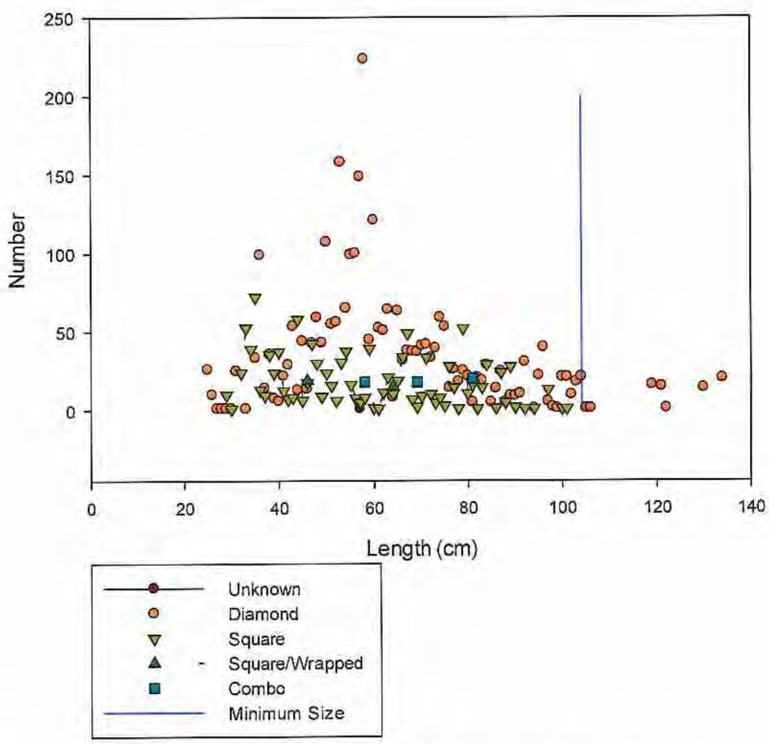


Figure 83: Observed halibut discards by mesh shape.

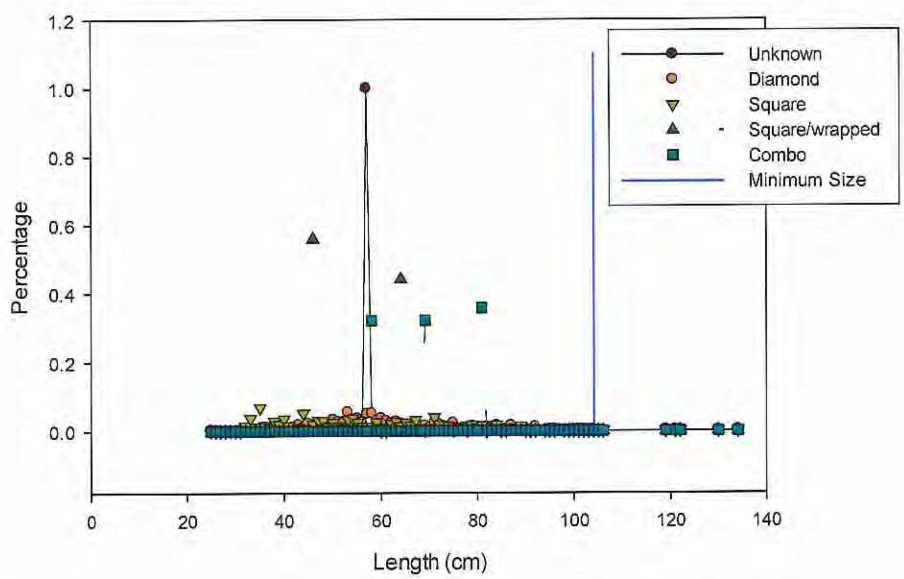


Figure 84: Proportional observed halibut discards by mesh shape.

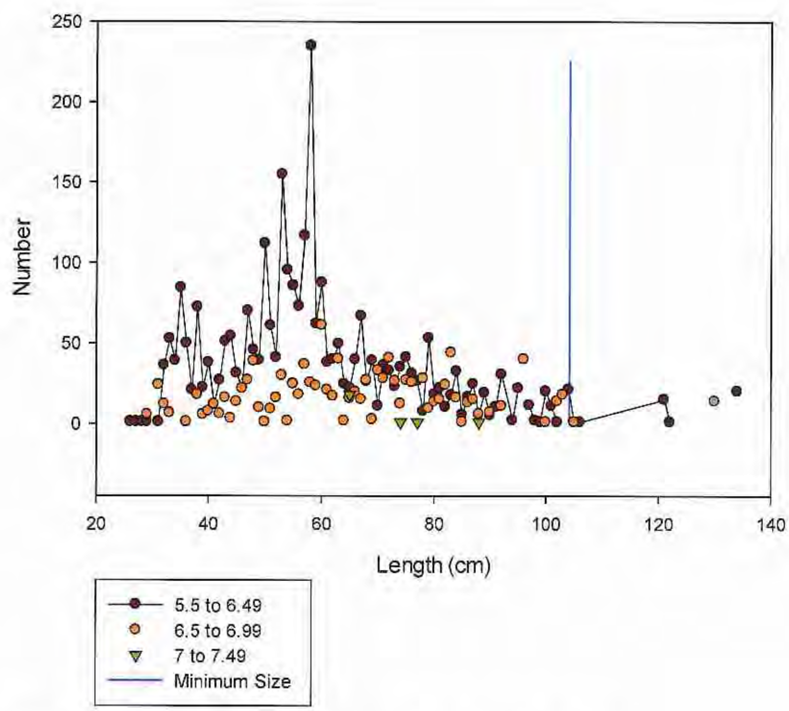


Figure 85: Observed halibut discards by mesh size.

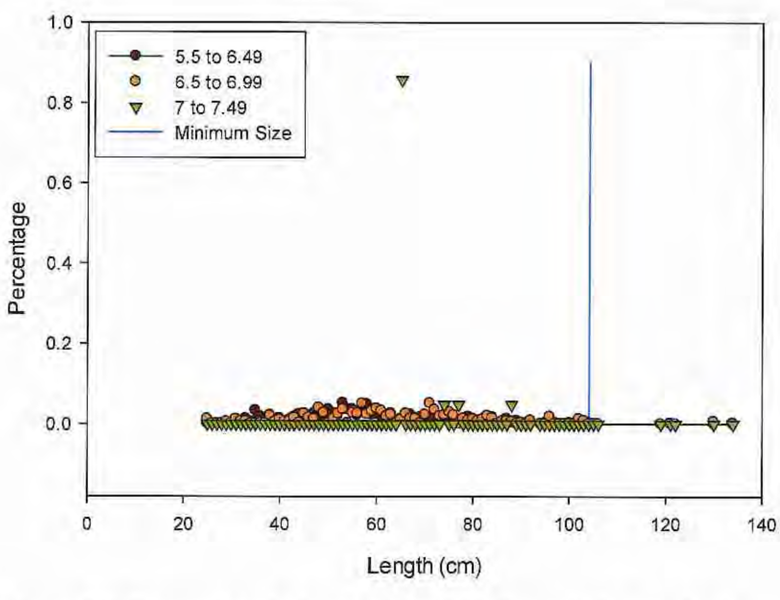


Figure 86: Proportional observed halibut discards by mesh size.

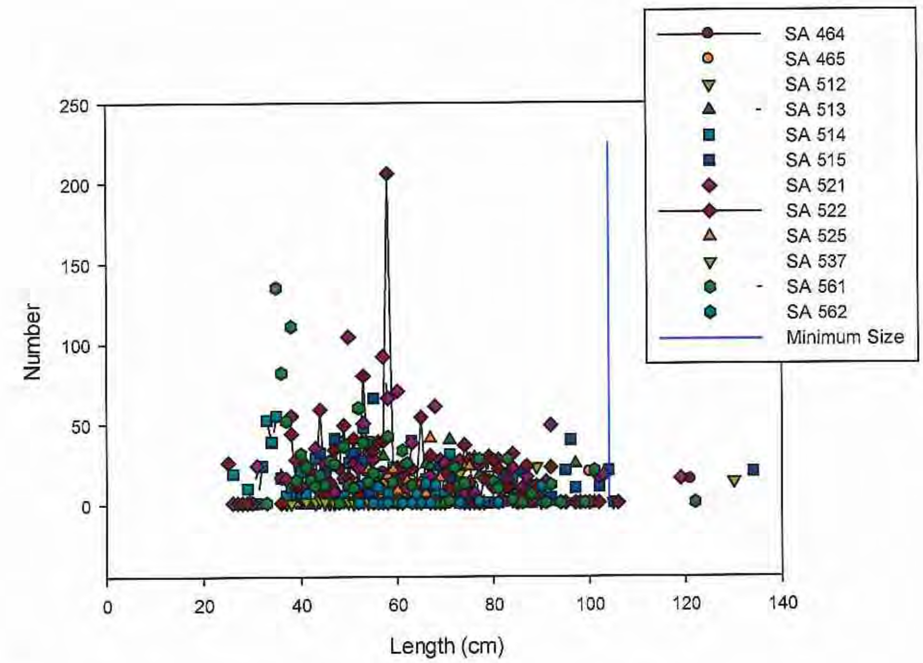


Figure 87: Observed halibut discards by statistical area.

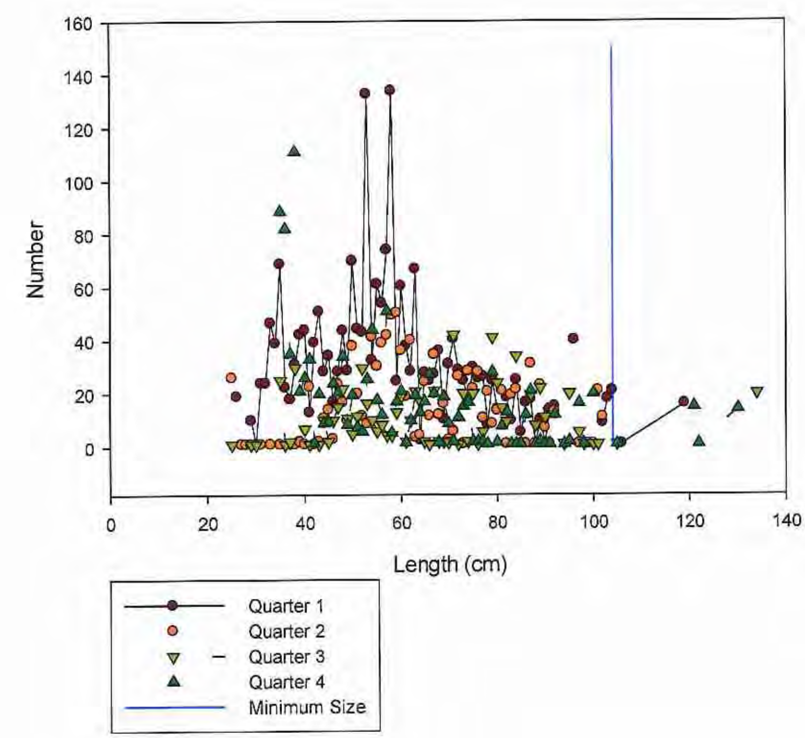


Figure 88: Observed halibut discards by quarter.

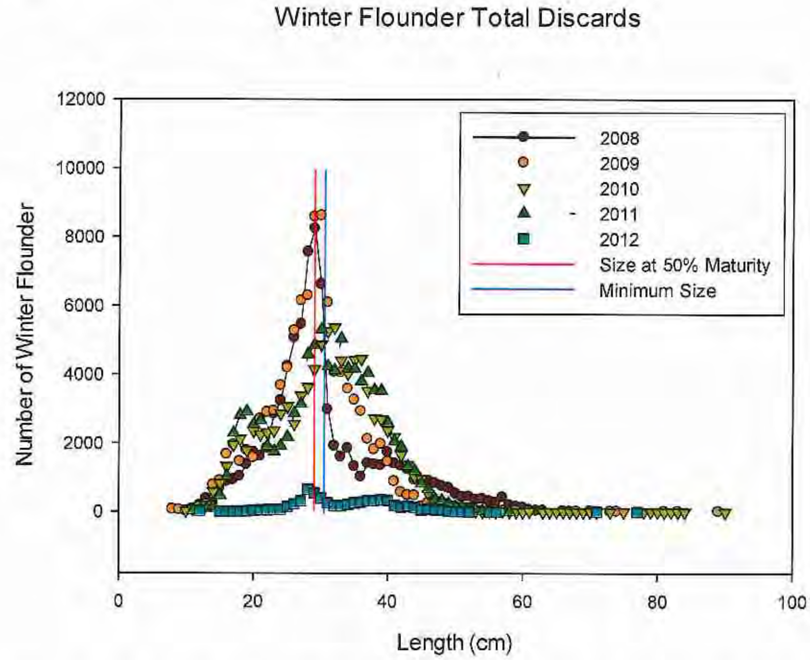


Figure 89: Total discards of winter flounder from ASM and NEFOP data from 2008 – 2012.

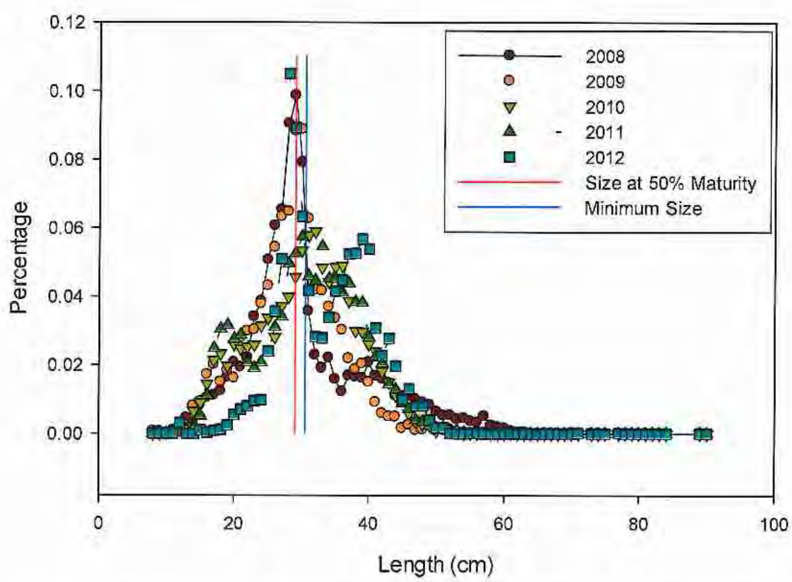


Figure 90: Proportional total discards of winter flounder from ASM and NEFOP data from 2008 – 2012.

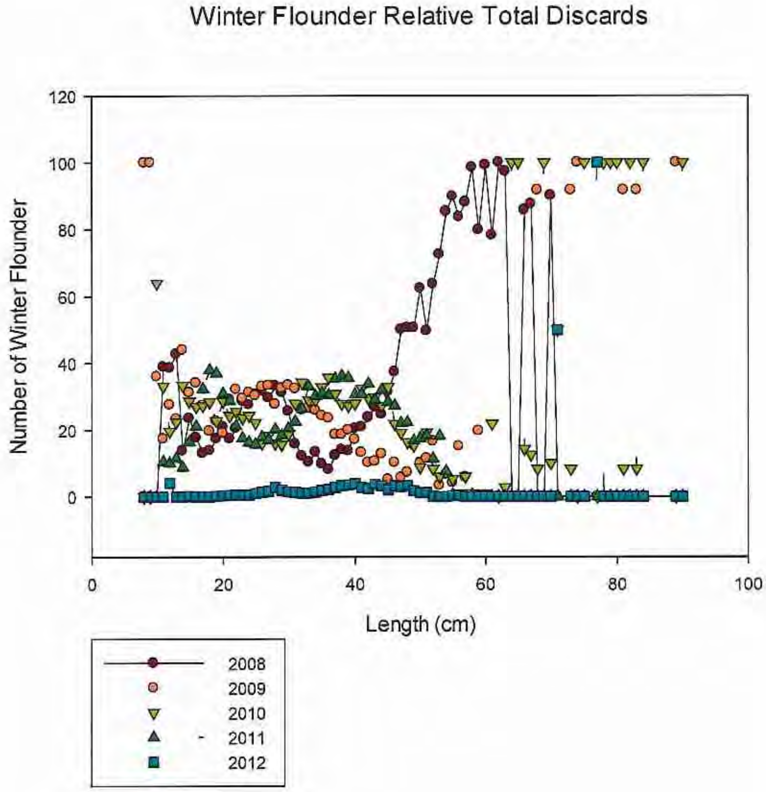


Figure 91: Relative total discards of winter flounder expressed as a percentage of the total.

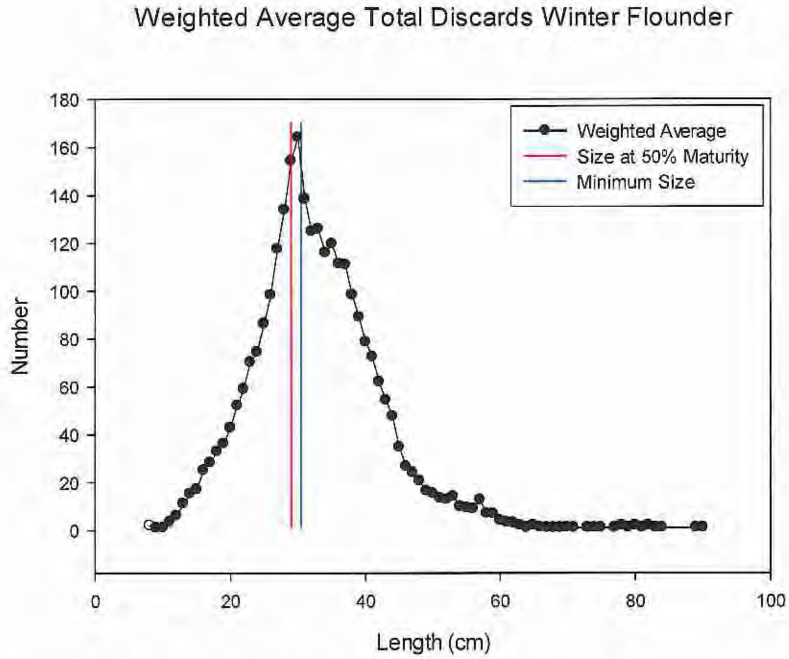


Figure 92: Weighted average total discards of winter flounder.

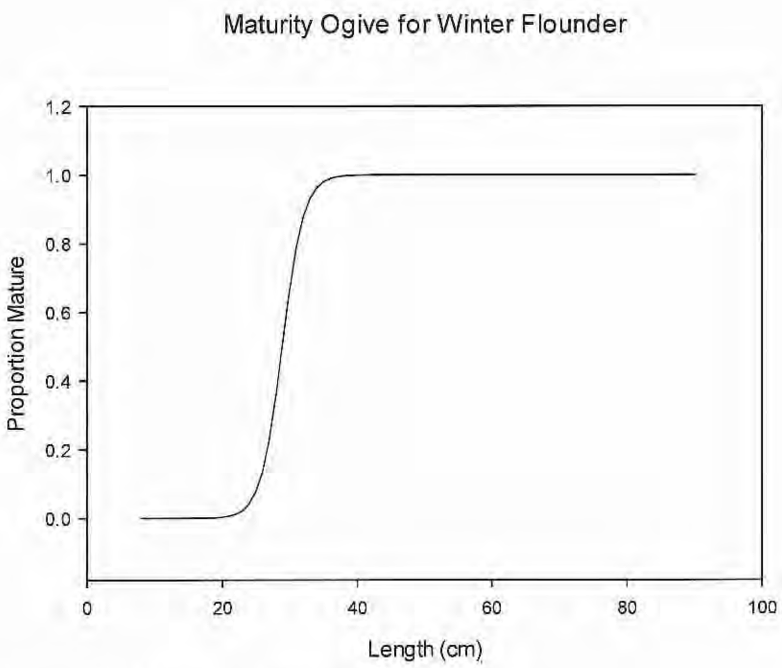


Figure 93: Maturity Ogive for winter flounder.

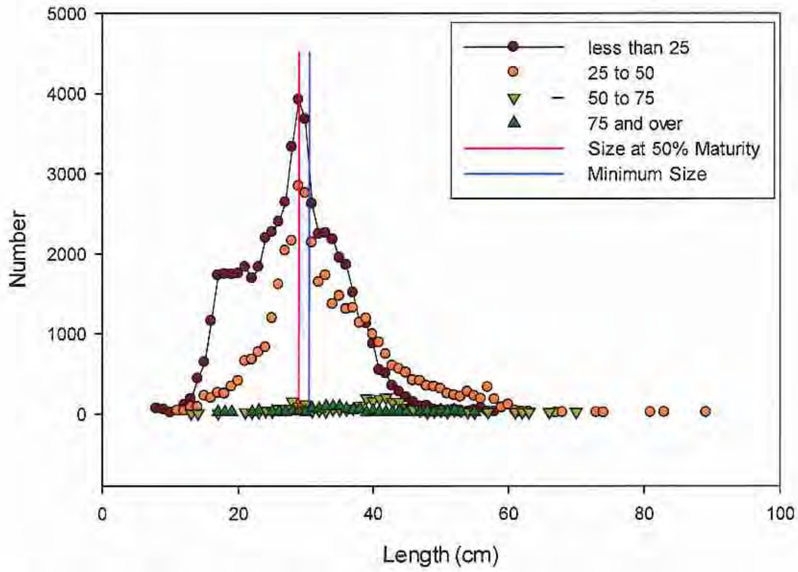


Figure 94: Observed winter flounder discards by depth.

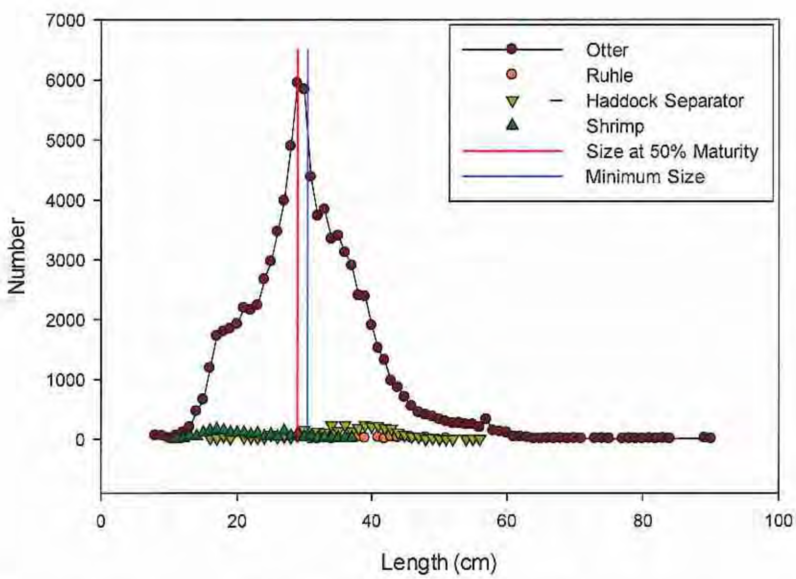


Figure 95: Observed winter flounder discards by gear type.

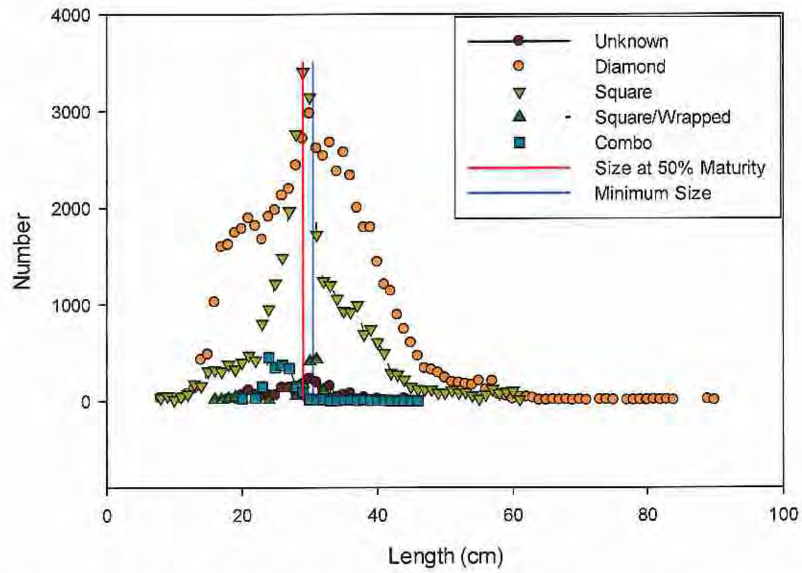


Figure 96: Observed winter flounder discards by mesh shape.

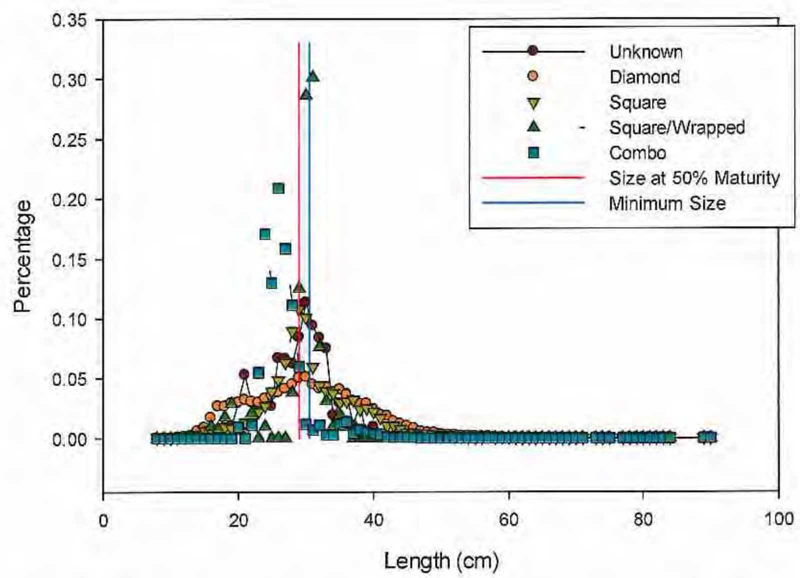


Figure 97: Proportional observed winter flounder discards by mesh shape.

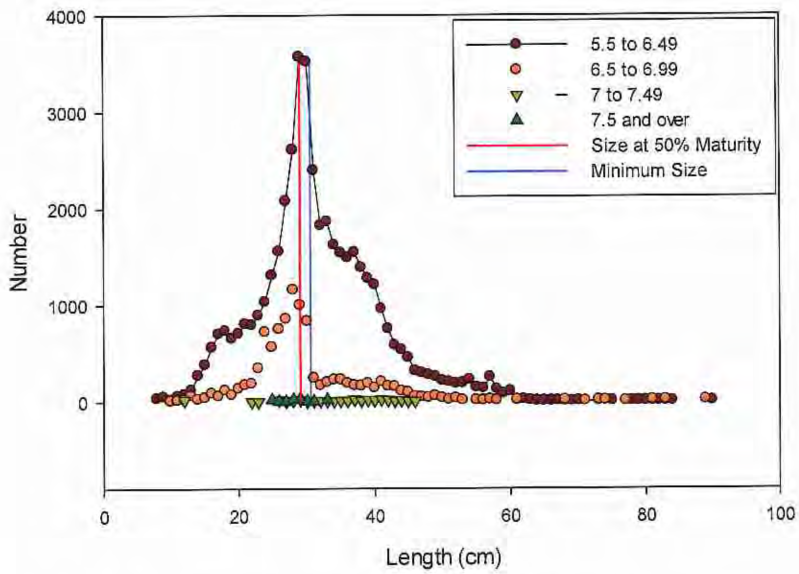


Figure 98: Observed winter flounder discards by mesh size.

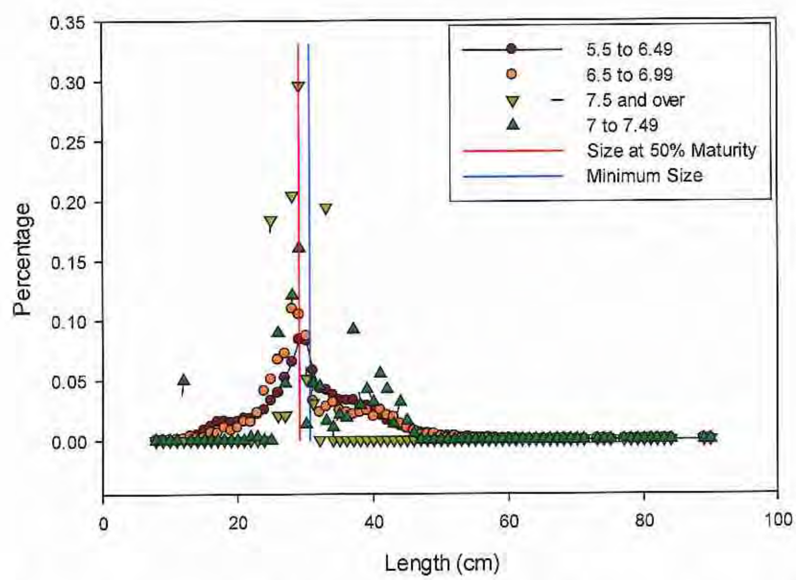


Figure 99: Proportional observed winter flounder discards by mesh size.

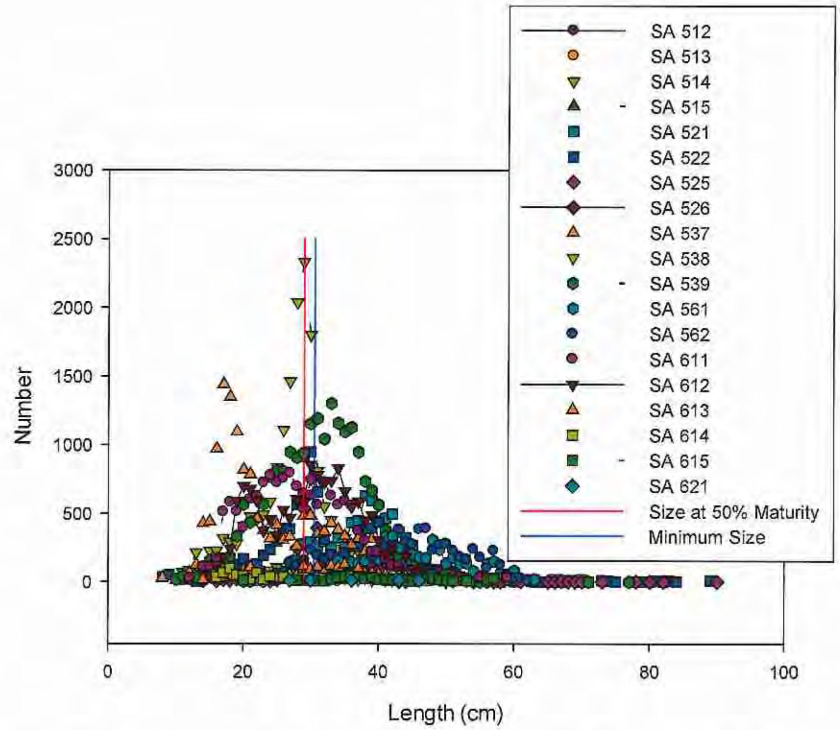


Figure 100: Observed winter flounder discards by statistical area.

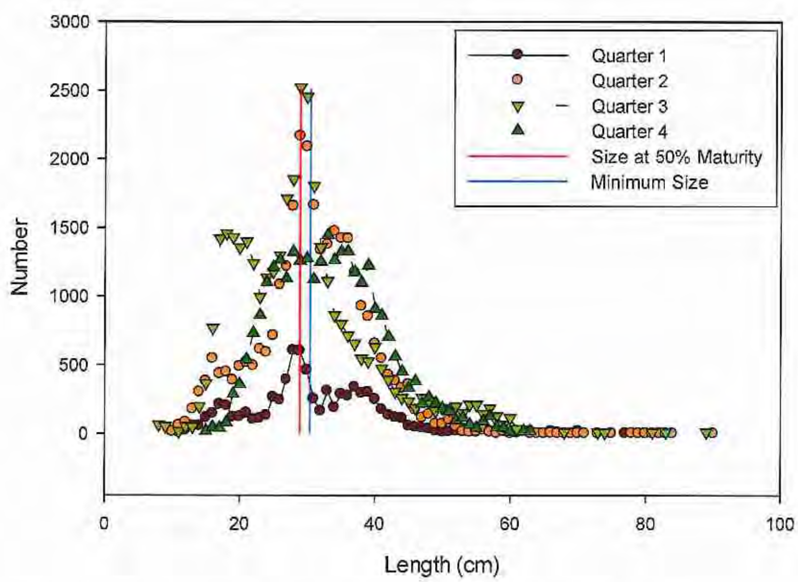


Figure 101: Observed winter flounder discards by quarter.

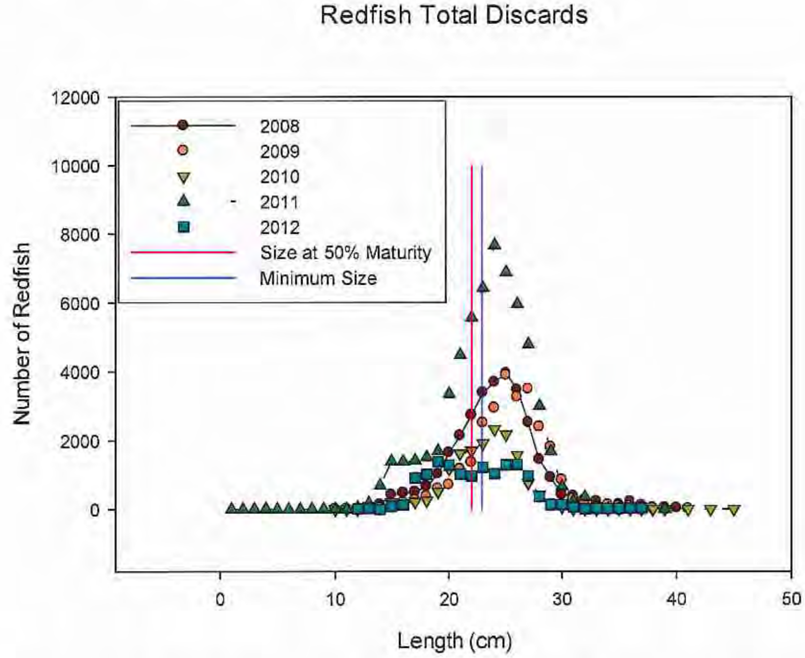


Figure 102: Total discards of redfish from ASM and NEFOP data from 2008 – 2012.

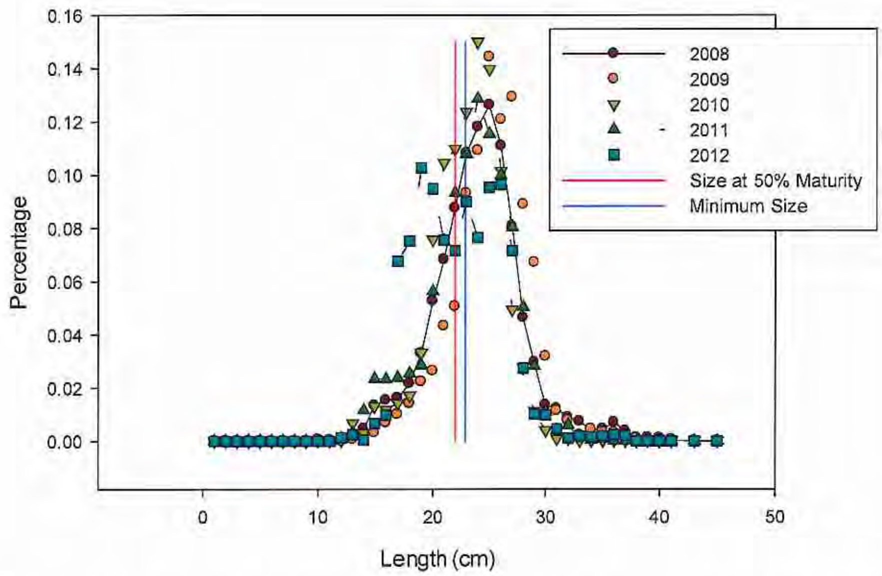


Figure 103: Proportional total discards of redfish from ASM and NEFOP data from 2008 – 2012.

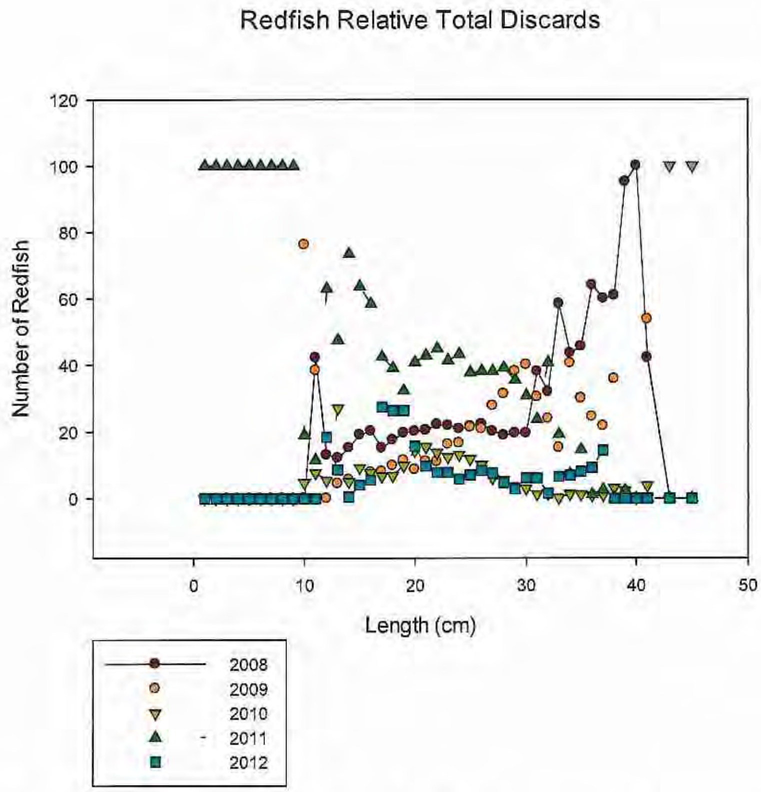


Figure 104: Relative total discards of redfish expressed as a percentage of the total.

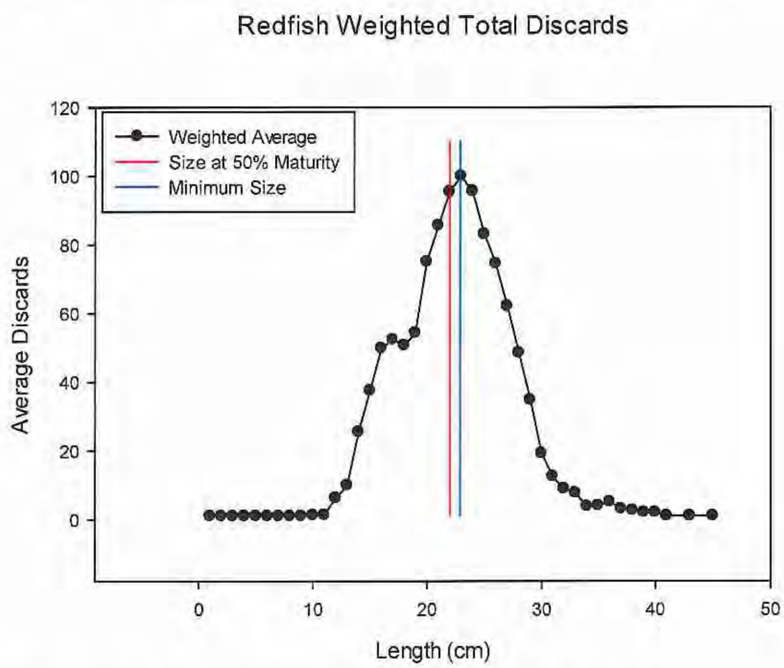


Figure 105: Weighted average total discards of redfish.

Enclosure (1)
Groundfish PDT report dated July 27, 2012

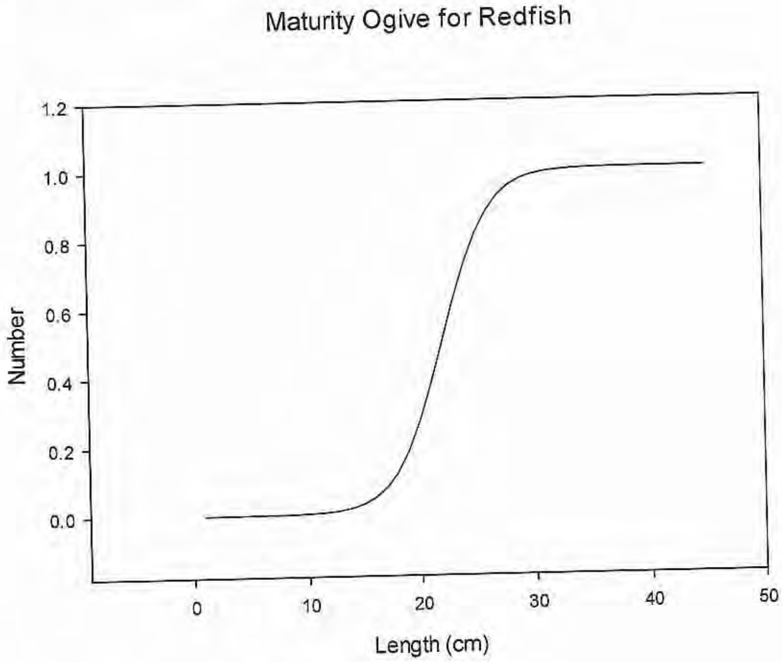


Figure 106: Maturity Ogive for redfish.

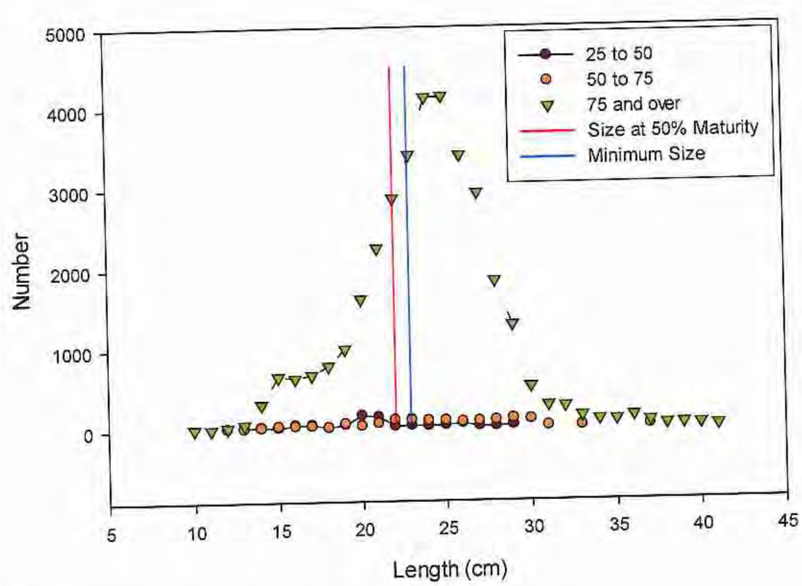


Figure 107: Observed redfish discards by depth.

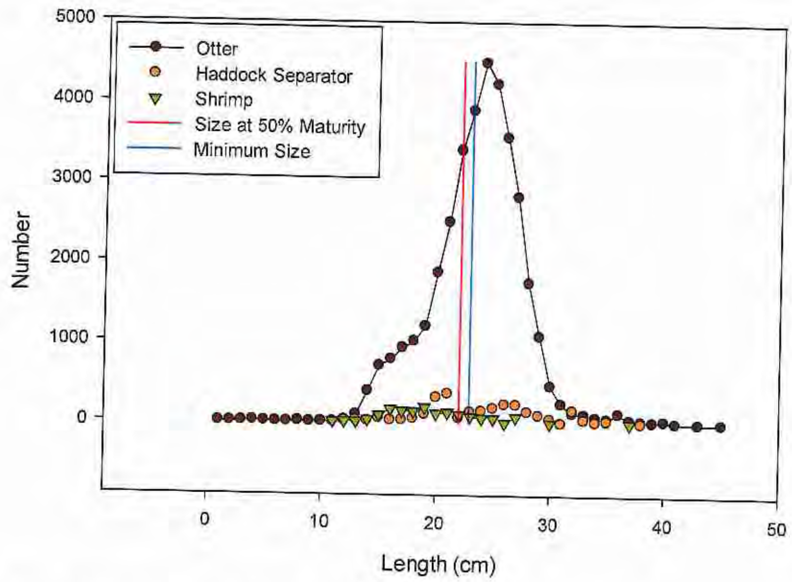


Figure 108: Observed redfish discards by gear type.

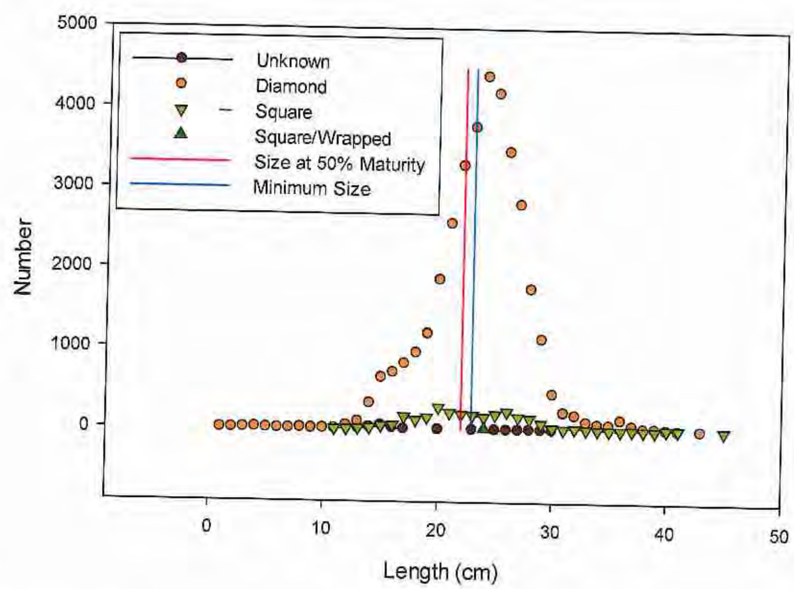


Figure 109: Observed redfish discards by mesh shape.

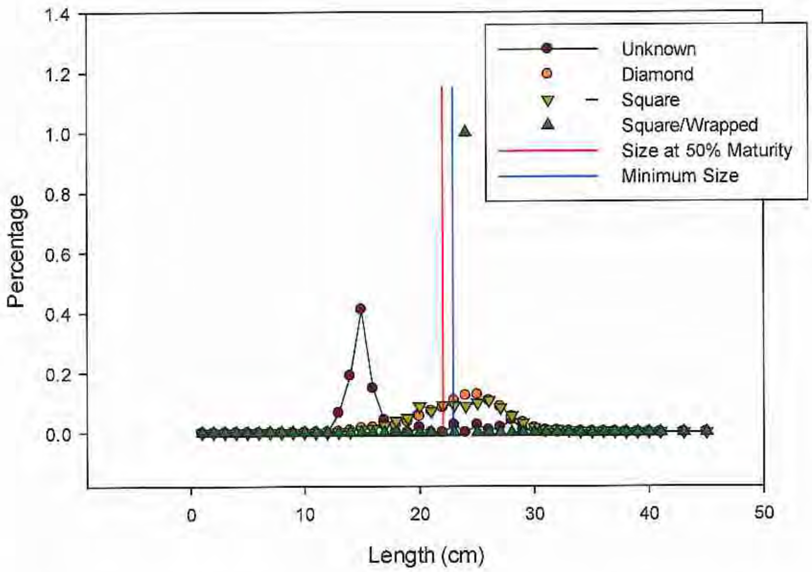


Figure 110: Proportional observed redfish discards by mesh shape.

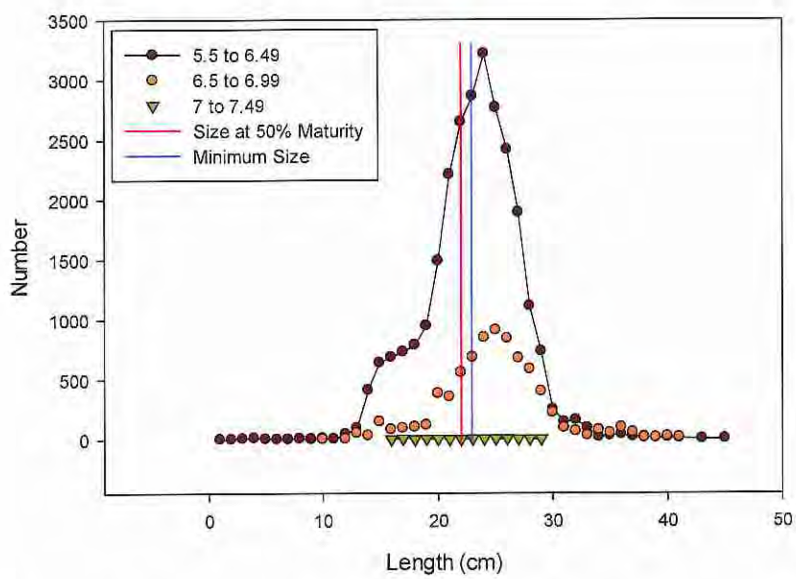


Figure 111: Observed redfish discards by mesh size.

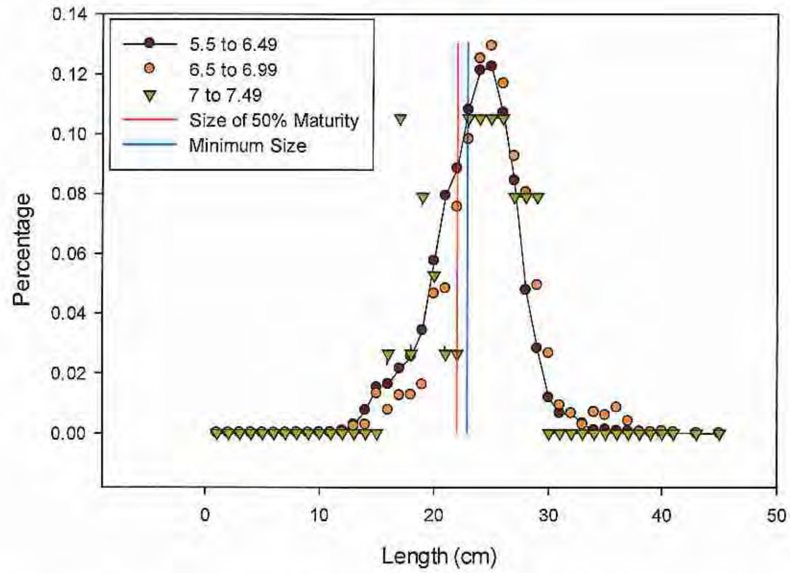


Figure 112: Proportional observed redfish discards by mesh size.

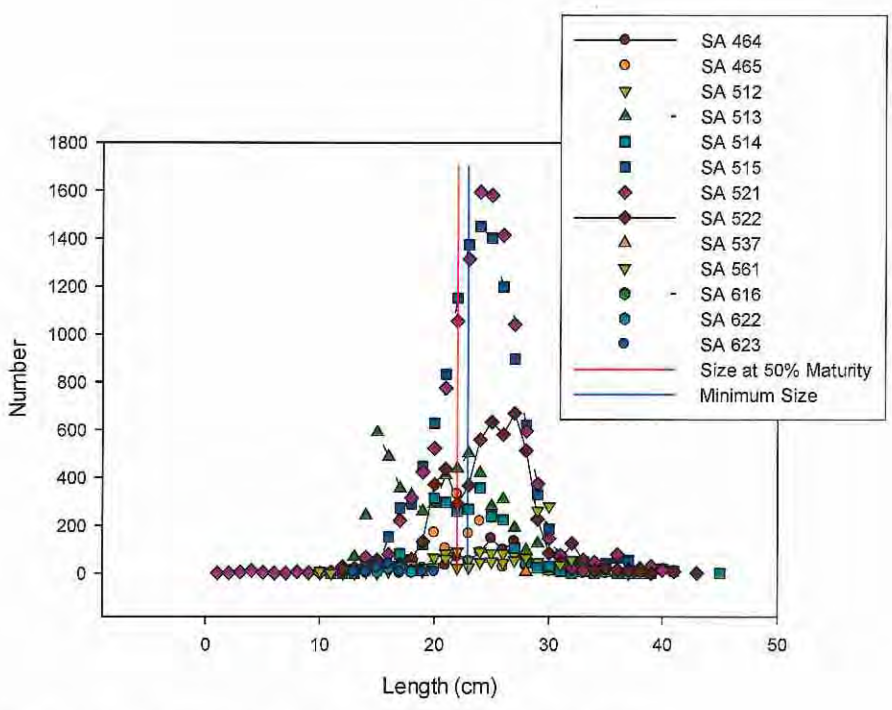


Figure 113: Observed redfish discards by statistical area.

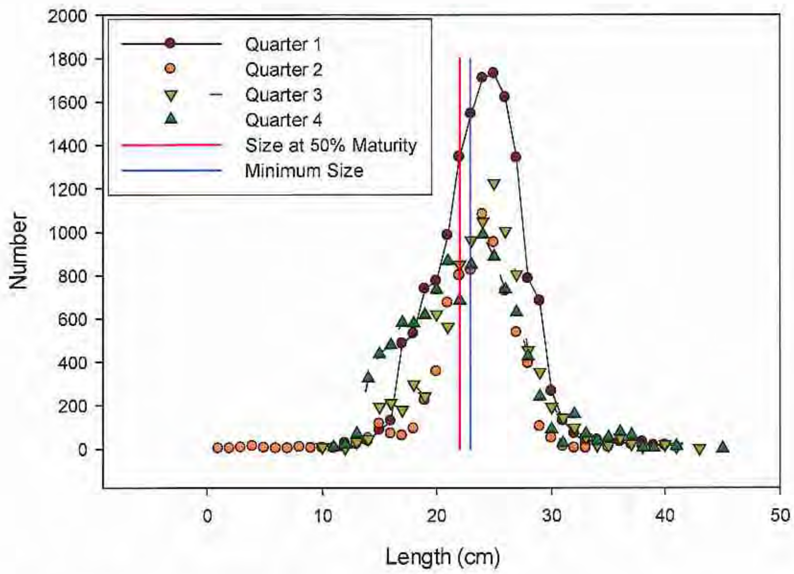


Figure 114: Observed redfish discards by quarter.

FY 2010 and FY 2011 Realized CVs
Groundfish PDT Report, July 27, 2012
Enclosure (2)

Table 1A: FY2010 Realized Groundfish Stock CV						
Stock	Discards (lbs)	Number of strata sub-trips	Number observed sub-trips	Percent sub-trips observed	Realized stock CV	Percent observer coverage required for CV30
GB Cod East	33,664	463	132	28.51	13.28	7.34
GB Cod West	228,695	5,195	1,732	33.34	6.4	2.23
GOM Cod	177,643	7,585	2,644	34.86	5.47	1.75
Plaice	391,821	13,211	4,178	31.63	4.79	1.17
GB Winter Flounder	41,798	1,612	420	26.05	15.73	8.87
GOM Winter Flounder	3,526	7,585	2,644	34.86	10.31	5.95
Witch Flounder	130,375	13,211	4,178	31.63	5.33	1.44
CC/GOM Yellowtail Flounder	134,063	10,203	3,526	34.56	7.93	3.56
GB Yellowtail Flounder	148,644	1,612	420	26.05	10.3	4.03
SNE/MA Yellowtail Flounder	9,409	1,395	427	30.61	12.97	7.67
GB Haddock East	36,004	463	132	28.51	12.35	6.48
GB Haddock West	50,051	5,195	1,732	33.34	14.85	10.93
GOM Haddock	5,798	7,585	2,644	34.86	10.84	6.54
White Hake	71,276	13,211	4,178	31.63	8.79	3.82
Pollock	171,801	13,211	4,178	31.63	9.81	4.72
Redfish	341,123	13,211	4,178	31.63	11.94	6.83
SNE/MA Winter Flounder	73,787	4,031	1,513	37.53	7.75	3.87
Southern Windowpane	110,095	1,395	427	30.61	8.8	3.73
Northern Windowpane	345,804	11,817	3,768	31.89	11.17	6.1
Ocean Pout	126,770	13,211	4,178	31.63	9.23	4.19
Halibut	44,370	13,211	4,178	31.63	5.3	1.42
Wolffish	42,836	13,211	4,178	31.63	6.45	2.1

Table 1B: FY2011 Realized Groundfish Stock CV						
Stock	Discards (lbs)	Number of strata sub-trips	Number observed sub-trips	Percent sub-trips observed	Realized stock CV	Percent observer coverage required for CV30
GB Cod East	73,475	481	152	31.6	13.95	9.15
GB Cod West	251,340	6,230	1,694	27.19	9.92	3.93
GOM Cod	322,451	10,320	2,986	28.93	4.6	0.95
Plaice	443,138	17,020	4,436	26.06	4.3	0.72
GB Winter Flounder	29,363	1,643	399	24.28	28.94	23.01
GOM Winter Flounder	11,088	10,320	2,986	28.93	9.71	4.1
Witch Flounder	140,105	17,020	4,436	26.06	4.99	0.97
CC/GOM Yellowtail Flounder	188,796	13,433	3,732	27.78	6.96	2.03
GB Yellowtail Flounder	105,824	1,643	399	24.28	10.52	3.83
SNE/MA Yellowtail Flounder	39,884	1,952	538	27.56	9.99	4.1
GB Haddock East	93,137	481	152	31.6	16.48	12.27
GB Haddock West	88,701	6,230	1,694	27.19	10.09	4.06
GOM Haddock	16,481	10,320	2,986	28.93	8	2.82
White Hake	72,090	17,020	4,436	26.06	8.3	2.63
Pollock	243,236	17,020	4,436	26.06	8.26	2.61
Redfish	415,048	17,020	4,436	26.06	9.27	3.26
SNE/MA Winter Flounder	189,565	5,074	1,503	29.62	12.09	6.41
Southern Windowpane	177,208	1,952	538	27.56	8.49	2.97
Northern Windowpane	348,789	15,071	3,931	26.08	9.04	3.11
Ocean Pout	129,689	17,020	4,436	26.06	10.02	3.79
Halibut	68,897	17,020	4,436	26.06	6.6	1.68
Wolffish	72,463	17,020	4,436	26.06	6.81	1.79

Table 2A: FY2010 Realized Groundfish Stock CV for Sector and Stock

Sector	Stock	Discards (lbs)	Number of strata sub-trips	Number observed sub-trips	Percent sub-trips observed	Realized stock CV	Percent observer coverage required for CV30
FIXED GEAR	GB Cod East	13,723	56	12	21.43	12.57	5.36
FIXED GEAR	GB Cod West	40,223	1,851	761	41.11	8.07	4.86
FIXED GEAR	GOM Cod	29,409	151	53	35.1	15.94	13.91
FIXED GEAR	Plaice	446	2,058	824	40.04	27.49	35.96
FIXED GEAR	GB Winter Flounder	64	87	37	42.53	41.69	59.77
FIXED GEAR	GOM Winter Flounder	33	151	53	35.1	34.86	42.38
FIXED GEAR	Witch Flounder	106	2,058	824	40.04	49.75	64.77
FIXED GEAR	CC/GOM Yellowtail Flounder	766	1,807	746	41.28	16.48	17.54
FIXED GEAR	GB Yellowtail Flounder	13	87	37	42.53	53.59	71.26
FIXED GEAR	SNE/MA Yellowtail Flounder	27	167	59	35.33	53.03	63.47
FIXED GEAR	GB Haddock East	8,344	56	12	21.43	27.72	19.64
FIXED GEAR	GB Haddock West	8,708	1,851	761	41.11	17.8	19.77
FIXED GEAR	GOM Haddock	9	151	53	35.1	80.9	80.13
FIXED GEAR	White Hake	5,982	2,058	824	40.04	22.98	28.18
FIXED GEAR	Pollock	27,975	2,058	824	40.04	18.37	20.07
FIXED GEAR	Redfish	319	2,058	824	40.04	19.2	21.53
FIXED GEAR	SNE/MA Winter Flounder	6,807	1,822	750	41.16	13.27	12.07
FIXED GEAR	Southern Windowpane	54	167	59	35.33	61.34	70.06
FIXED GEAR	Northern Windowpane	801	1,892	767	40.54	31.06	42.23
FIXED GEAR	Ocean Pout	2,516	2,058	824	40.04	26.91	34.99
FIXED GEAR	Halibut	1,184	2,058	824	40.04	20.07	23.03
FIXED GEAR	Wolffish	5,300	2,058	824	40.04	12.35	10.2
NCCS	GOM Cod	250	41	18	43.9	62.44	78.05
NCCS	Plaice	-	41	18	43.9		
NCCS	GOM Winter Flounder	-	41	18	43.9		
NCCS	Witch Flounder	-	41	18	43.9		
NCCS	CC/GOM Yellowtail Flounder	-	41	18	43.9		
NCCS	GOM Haddock	37	41	18	43.9	49.93	70.73
NCCS	White Hake	89	41	18	43.9	51.61	70.73
NCCS	Pollock	1	41	18	43.9	83.64	87.8
NCCS	Redfish	2	41	18	43.9	83.22	87.8
NCCS	Northern Windowpane	-	41	18	43.9		
NCCS	Ocean Pout	-	41	18	43.9		
NCCS	Halibut	2,353	41	18	43.9	46.19	65.85
NCCS	Wolffish	155	41	18	43.9	81.28	85.37

FY 2010

PORT CYLDE	GOM Cod	3,440	488	161	32.99	11.49	6.76
PORT CYLDE	Plaice	10,133	488	161	32.99	20.5	18.85
PORT CYLDE	GOM Winter Flounder	65	488	161	32.99	72.76	74.39
PORT CYLDE	Witch Flounder	6,518	488	161	32.99	17.34	14.14
PORT CYLDE	CC/GOM Yellowtail Flounder	769	488	161	32.99	70.08	72.95
PORT CYLDE	GOM Haddock	155	488	161	32.99	23.64	23.57
PORT CYLDE	White Hake	3,023	488	161	32.99	19.68	17.62
PORT CYLDE	Pollock	4,290	488	161	32.99	27.08	28.69
PORT CYLDE	Redfish	1,722	488	161	32.99	20.36	18.65
PORT CYLDE	Northern Windowpane	224	488	161	32.99	78.81	77.46
PORT CYLDE	Ocean Pout	27	488	161	32.99	60.6	66.8
PORT CYLDE	Halibut	2,850	488	161	32.99	19.93	18.03
PORT CYLDE	Wolffish	634	488	161	32.99	23.23	22.95
SUST HARV 1	GB Cod East	3,181	158	44	27.85	42.15	43.67
SUST HARV 1	GB Cod West	31,096	600	208	34.67	21.56	21.67
SUST HARV 1	GOM Cod	20,242	973	317	32.58	12.92	8.32
SUST HARV 1	Plaice	173,053	1,715	402	23.44	8.48	2.39
SUST HARV 1	GB Winter Flounder	1,707	417	104	24.94	43.73	41.49
SUST HARV 1	GOM Winter Flounder	264	973	317	32.58	26.58	27.54
SUST HARV 1	Witch Flounder	52,197	1,715	402	23.44	9.4	2.97
SUST HARV 1	CC/GOM Yellowtail Flounder	9,498	1,243	354	28.48	35.12	35.32
SUST HARV 1	GB Yellowtail Flounder	16,550	417	104	24.94	16.78	9.59
SUST HARV 1	SNE/MA Yellowtail Flounder	688	57	12	21.05	36.21	28.07
SUST HARV 1	GB Haddock East	16,337	158	44	27.85	22.03	17.72
SUST HARV 1	GB Haddock West	15,467	600	208	34.67	35.1	42.17
SUST HARV 1	GOM Haddock	2,502	973	317	32.58	21.29	19.63
SUST HARV 1	White Hake	25,698	1,715	402	23.44	17.65	9.62
SUST HARV 1	Pollock	46,580	1,715	402	23.44	13.6	5.95
SUST HARV 1	Redfish	143,166	1,715	402	23.44	16.09	8.1
SUST HARV 1	SNE/MA Winter Flounder	2,932	342	160	46.78	25.55	39.18
SUST HARV 1	Southern Windowpane	4,764	57	12	21.05	49.08	42.11
SUST HARV 1	Northern Windowpane	18,053	1,658	391	23.58	22.44	14.78
SUST HARV 1	Ocean Pout	9,271	1,715	402	23.44	39.98	35.28
SUST HARV 1	Halibut	8,867	1,715	402	23.44	10.29	3.5
SUST HARV 1	Wolffish	9,022	1,715	402	23.44	19.15	11.14

FY 2010

TRI-STATE	GB Cod West	2,547	19	7	36.84	29.59	36.84
TRI-STATE	GOM Cod	445	92	24	26.09	26.36	21.74
TRI-STATE	Plaice	2,984	111	31	27.93	48.09	50.45
TRI-STATE	GB Winter Flounder	281	19	7	36.84	37.58	52.63
TRI-STATE	GOM Winter Flounder	22	92	24	26.09	45.89	45.65
TRI-STATE	Witch Flounder	845	111	31	27.93	25.73	22.52
TRI-STATE	CC/GOM Yellowtail Flounder	1,016	92	24	26.09	28	23.91
TRI-STATE	GB Yellowtail Flounder	4,731	19	7	36.84	24.61	31.58
TRI-STATE	GB Haddock West	3,418	19	7	36.84	50.26	63.16
TRI-STATE	GOM Haddock	-	92	24	26.09		
TRI-STATE	White Hake	608	111	31	27.93	56.49	58.56
TRI-STATE	Pollock	257	111	31	27.93	52.01	54.05
TRI-STATE	Redfish	-	111	31	27.93		
TRI-STATE	Northern Windowpane	3,459	111	31	27.93	33.6	33.33
TRI-STATE	Ocean Pout	1,381	111	31	27.93	26.24	23.42
TRI-STATE	Halibut	154	111	31	27.93	41.66	43.24
TRI-STATE	Wolffish	95	111	31	27.93	74.33	71.17
NEFS 2	GB Cod East	1,869	57	19	33.33	29.19	33.33
NEFS 2	GB Cod West	14,621	262	90	34.35	16.43	13.74
NEFS 2	GOM Cod	54,220	1,436	487	33.91	8.71	4.18
NEFS 2	Plaice	60,898	1,755	517	29.46	8.17	3.02
NEFS 2	GB Winter Flounder	1,955	128	40	31.25	39.81	44.53
NEFS 2	GOM Winter Flounder	1,998	1,436	487	33.91	16.57	13.58
NEFS 2	Witch Flounder	18,000	1,755	517	29.46	10.31	4.73
NEFS 2	CC/GOM Yellowtail Flounder	75,070	1,627	511	31.41	13.2	8.17
NEFS 2	GB Yellowtail Flounder	9,765	128	40	31.25	34.46	37.5
NEFS 2	GB Haddock East	3,582	57	19	33.33	28.5	31.58
NEFS 2	GB Haddock West	926	262	90	34.35	21.06	20.61
NEFS 2	GOM Haddock	811	1,436	487	33.91	17.2	14.48
NEFS 2	White Hake	3,102	1,755	517	29.46	22.22	18.69
NEFS 2	Pollock	13,416	1,755	517	29.46	17.34	12.25
NEFS 2	Redfish	128,389	1,755	517	29.46	23.02	19.77
NEFS 2	SNE/MA Winter Flounder	859	191	82	42.93	68.94	80.1
NEFS 2	Northern Windowpane	26,065	1,755	517	29.46	11.35	5.64
NEFS 2	Ocean Pout	4,035	1,755	517	29.46	13.49	7.81
NEFS 2	Halibut	7,917	1,755	517	29.46	10.3	4.73
NEFS 2	Wolffish	10,057	1,755	517	29.46	11.69	5.98

FY 2010

NEFS 3	GB Cod West	189	129	26	20.16	50.42	41.86
NEFS 3	GOM Cod	30,219	2,273	777	34.18	6.53	2.42
NEFS 3	Plaice	1,509	2,402	802	33.39	32.12	36.51
NEFS 3	GOM Winter Flounder	375	2,273	777	34.18	13.79	9.9
NEFS 3	Witch Flounder	83	2,402	802	33.39	22.31	21.73
NEFS 3	CC/GOM Yellowtail Flounder	14,332	2,279	779	34.18	13.83	9.96
NEFS 3	SNE/MA Yellowtail Flounder	47	123	23	18.7	57.08	45.53
NEFS 3	GB Haddock West	72	129	26	20.16	92.53	71.32
NEFS 3	GOM Haddock	1,329	2,273	777	34.18	14.75	11.17
NEFS 3	White Hake	725	2,402	802	33.39	22.66	22.27
NEFS 3	Pollock	7,613	2,402	802	33.39	22.33	21.77
NEFS 3	Redfish	401	2,402	802	33.39	17.19	14.15
NEFS 3	SNE/MA Winter Flounder	8	129	26	20.16	90.53	69.77
NEFS 3	Southern Windowpane	43	123	23	18.7	85.19	65.04
NEFS 3	Northern Windowpane	723	2,279	779	34.18	11.79	7.46
NEFS 3	Ocean Pout	645	2,402	802	33.39	26.1	27.52
NEFS 3	Halibut	1,822	2,402	802	33.39	14.93	11.07
NEFS 3	Wolffish	3,777	2,402	802	33.39	27.08	29.02
NEFS 5	GB Cod East	163	4	-	0		
NEFS 5	GB Cod West	25,336	628	236	37.58	15.58	14.01
NEFS 5	GOM Cod	5	1	-	0		
NEFS 5	Plaice	1,612	633	236	37.28	59.54	70.14
NEFS 5	GB Winter Flounder	516	59	12	20.34	39.05	30.51
NEFS 5	GOM Winter Flounder	-	1	-	0		
NEFS 5	Witch Flounder	1,799	633	236	37.28	24.11	27.8
NEFS 5	CC/GOM Yellowtail Flounder	25	3	-	0		
NEFS 5	GB Yellowtail Flounder	8,806	59	12	20.34	34.21	25.42
NEFS 5	SNE/MA Yellowtail Flounder	3,486	571	228	39.93	13.87	12.61
NEFS 5	GB Haddock East	429	4	-	0		
NEFS 5	GB Haddock West	2,766	628	236	37.58	37.57	48.73
NEFS 5	GOM Haddock	-	1	-	0		
NEFS 5	White Hake	496	633	236	37.28	38.23	49.13
NEFS 5	Pollock	19	633	236	37.28	75.17	78.99
NEFS 5	Redfish	83	633	236	37.28	61.5	71.56
NEFS 5	SNE/MA Winter Flounder	29,860	573	228	39.79	8.2	4.71
NEFS 5	Southern Windowpane	64,184	571	228	39.93	9.16	5.95
NEFS 5	Northern Windowpane	20,083	62	12	19.35	36.31	27.42
NEFS 5	Ocean Pout	13,919	633	236	37.28	23.04	26.07
NEFS 5	Halibut	49	633	236	37.28	49.52	61.93
NEFS 5	Wolffish	-	633	236	37.28		

FY 2010

NEFS 6	GB Cod East	131	12	1	8.33		
NEFS 6	GB Cod West	2,146	91	24	26.37	38.36	37.36
NEFS 6	GOM Cod	869	110	27	24.55	25.59	20
NEFS 6	Plaice	25,634	213	34	15.96	19.88	7.98
NEFS 6	GB Winter Flounder	70	26	5	19.23	29.73	19.23
NEFS 6	GOM Winter Flounder	119	110	27	24.55	63.97	60
NEFS 6	Witch Flounder	4,818	213	34	15.96	24.89	11.74
NEFS 6	CC/GOM Yellowtail Flounder	1,691	185	30	16.22	48.73	34.05
NEFS 6	GB Yellowtail Flounder	1,900	26	5	19.23	99.42	73.08
NEFS 6	SNE/MA Yellowtail Flounder	-	2	1	50		
NEFS 6	GB Haddock East	346	12	1	8.33		
NEFS 6	GB Haddock West	15	91	24	26.37	62.17	61.54
NEFS 6	GOM Haddock	4	110	27	24.55	74.37	67.27
NEFS 6	White Hake	297	213	34	15.96	63.92	46.48
NEFS 6	Pollock	3,660	213	34	15.96	38.45	23.94
NEFS 6	Redfish	5,678	213	34	15.96	27.07	13.62
NEFS 6	SNE/MA Winter Flounder	94	77	23	29.87	87.56	79.22
NEFS 6	Southern Windowpane	-	2	1	50		
NEFS 6	Northern Windowpane	938	211	33	15.64	39.12	24.17
NEFS 6	Ocean Pout	7,094	213	34	15.96	61.04	44.13
NEFS 6	Halibut	1,286	213	34	15.96	30.58	16.9
NEFS 6	Wolffish	648	213	34	15.96	53.57	38.03
NEFS 7	GB Cod East	223	24	12	50	50.26	75
NEFS 7	GB Cod West	7,575	402	94	23.38	23.82	16.17
NEFS 7	GOM Cod	295	3	-	0		
NEFS 7	Plaice	20,861	426	97	22.77	16.61	8.45
NEFS 7	GB Winter Flounder	5,909	188	49	26.06	39.22	37.77
NEFS 7	GOM Winter Flounder	3	3	-	0		
NEFS 7	Witch Flounder	10,183	426	97	22.77	21.18	12.91
NEFS 7	CC/GOM Yellowtail Flounder	618	73	20	27.4	66.57	65.75
NEFS 7	GB Yellowtail Flounder	10,607	188	49	26.06	18.24	11.7
NEFS 7	SNE/MA Yellowtail Flounder	1,049	165	41	24.85	62.38	59.39
NEFS 7	GB Haddock East	77	24	12	50	15.87	25
NEFS 7	GB Haddock West	3,053	402	94	23.38	18.62	10.7
NEFS 7	GOM Haddock	18	3	-	0		
NEFS 7	White Hake	7,365	426	97	22.77	27.39	19.95
NEFS 7	Pollock	1,625	426	97	22.77	66.82	59.62
NEFS 7	Redfish	2,028	426	97	22.77	33.42	27
NEFS 7	SNE/MA Winter Flounder	3,444	235	60	25.53	59.87	57.87
NEFS 7	Southern Windowpane	3,924	165	41	24.85	48.58	46.67
NEFS 7	Northern Windowpane	33,750	261	59	22.61	15.56	7.66
NEFS 7	Ocean Pout	10,597	426	97	22.77	32.13	25.35
NEFS 7	Halibut	1,050	426	97	22.77	24.42	16.43
NEFS 7	Wolffish	1,318	426	97	22.77	30.49	23.47

FY 2010

NEFS 8	GB Cod East	4,800	45	14	31.11	23.5	22.22
NEFS 8	GB Cod West	16,377	188	47	25	22.09	15.43
NEFS 8	GOM Cod	-	8	2	25		
NEFS 8	Plaice	20,100	232	49	21.12	25.38	16.38
NEFS 8	GB Winter Flounder	6,135	156	39	25	47.15	45.51
NEFS 8	GOM Winter Flounder	-	8	2	25		
NEFS 8	Witch Flounder	5,682	232	49	21.12	33.32	25
NEFS 8	CC/GOM Yellowtail Flounder	1,076	54	12	22.22	48.23	42.59
NEFS 8	GB Yellowtail Flounder	19,120	156	39	25	29.13	24.36
NEFS 8	SNE/MA Yellowtail Flounder	80	22	5	22.73	59.77	54.55
NEFS 8	GB Haddock East	2,471	45	14	31.11	31.21	33.33
NEFS 8	GB Haddock West	2,715	188	47	25	30.8	26.06
NEFS 8	GOM Haddock	-	8	2	25		
NEFS 8	White Hake	505	232	49	21.12	36.99	29.31
NEFS 8	Pollock	443	232	49	21.12	57.04	49.57
NEFS 8	Redfish	1,980	232	49	21.12	49.47	42.24
NEFS 8	SNE/MA Winter Flounder	8,828	72	20	27.78	59.9	61.11
NEFS 8	Southern Windowpane	2,503	22	5	22.73	62.65	59.09
NEFS 8	Northern Windowpane	34,473	210	46	21.9	12.16	4.76
NEFS 8	Ocean Pout	21,630	232	49	21.12	21.7	12.5
NEFS 8	Halibut	2,648	232	49	21.12	37.3	29.31
NEFS 8	Wolffish	259	232	49	21.12	45.37	38.36
NEFS 9	GB Cod East	8,741	83	23	27.71	13.96	8.43
NEFS 9	GB Cod West	70,335	441	86	19.5	13.75	4.99
NEFS 9	GOM Cod	789	50	14	28	37.55	38
NEFS 9	Plaice	44,543	571	95	16.64	15.41	5.08
NEFS 9	GB Winter Flounder	19,795	336	74	22.02	24.57	16.07
NEFS 9	GOM Winter Flounder	6	50	14	28	88.21	78
NEFS 9	Witch Flounder	21,214	571	95	16.64	17.42	6.48
NEFS 9	CC/GOM Yellowtail Flounder	2,893	211	56	26.54	46.79	46.92
NEFS 9	GB Yellowtail Flounder	62,433	336	74	22.02	20.88	12.2
NEFS 9	SNE/MA Yellowtail Flounder	-	22	1	4.55		
NEFS 9	GB Haddock East	3,861	83	23	27.71	17.53	12.05
NEFS 9	GB Haddock West	10,368	441	86	19.5	24.73	14.29
NEFS 9	GOM Haddock	59	50	14	28	44.61	48
NEFS 9	White Hake	13,386	571	95	16.64	19.07	7.53
NEFS 9	Pollock	6,089	571	95	16.64	27.74	14.71
NEFS 9	Redfish	46,832	571	95	16.64	25.35	12.61
NEFS 9	SNE/MA Winter Flounder	9,045	183	52	28.42	34.58	34.97
NEFS 9	Southern Windowpane	336	22	1	4.55		
NEFS 9	Northern Windowpane	149,337	549	95	17.3	25.4	13.11
NEFS 9	Ocean Pout	32,507	571	95	16.64	15.58	5.25
NEFS 9	Halibut	5,829	571	95	16.64	19.2	7.71
NEFS 9	Wolffish	5,558	571	95	16.64	22.93	10.51

NEFS 10	GB Cod West	1,108	122	44	36.07	25.82	29.51
NEFS 10	GOM Cod	11,584	623	265	42.54	9.45	6.9
NEFS 10	Plaice	6,448	745	304	40.81	15.55	15.7
NEFS 10	GOM Winter Flounder	407	623	265	42.54	18.76	22.47
NEFS 10	Witch Flounder	1,077	745	304	40.81	17.27	18.66
NEFS 10	CC/GOM Yellowtail Flounder	17,846	727	301	41.4	11.28	9.22
NEFS 10	SNE/MA Yellowtail Flounder	-	18	3	16.67		
NEFS 10	GB Haddock West	19	122	44	36.07	56.11	66.39
NEFS 10	GOM Haddock	100	623	265	42.54	35.03	50.24
NEFS 10	White Hake	898	745	304	40.81	26.85	35.57
NEFS 10	Pollock	1,723	745	304	40.81	32.49	44.83
NEFS 10	Redfish	595	745	304	40.81	53.65	68.86
NEFS 10	SNE/MA Winter Flounder	682	122	44	36.07	28.15	33.61
NEFS 10	Southern Windowpane	-	18	3	16.67		
NEFS 10	Northern Windowpane	5,547	727	301	41.4	17.56	19.53
NEFS 10	Ocean Pout	2,913	745	304	40.81	17.77	19.6
NEFS 10	Halibut	918	745	304	40.81	16.74	17.72
NEFS 10	Wolffish	3,256	745	304	40.81	12.25	10.34
NEFS 11	GB Cod West	-	114	13	11.4		
NEFS 11	GOM Cod	24,090	1,270	470	37.01	14.5	12.13
NEFS 11	Plaice	4,968	1,384	483	34.9	26.73	29.91
NEFS 11	GOM Winter Flounder	130	1,270	470	37.01	24.79	28.66
NEFS 11	Witch Flounder	1,178	1,384	483	34.9	30.84	36.2
NEFS 11	CC/GOM Yellowtail Flounder	1,621	1,270	470	37.01	33.58	42.44
NEFS 11	SNE/MA Yellowtail Flounder	-	114	13	11.4		
NEFS 11	GB Haddock West	-	114	13	11.4		
NEFS 11	GOM Haddock	774	1,270	470	37.01	16.36	14.88
NEFS 11	White Hake	4,354	1,384	483	34.9	40.12	48.99
NEFS 11	Pollock	57,358	1,384	483	34.9	20.42	19.94
NEFS 11	Redfish	3,515	1,384	483	34.9	39.26	47.9
NEFS 11	SNE/MA Winter Flounder	-	114	13	11.4		
NEFS 11	Southern Windowpane	-	114	13	11.4		
NEFS 11	Northern Windowpane	57	1,270	470	37.01	50.45	62.44
NEFS 11	Ocean Pout	12	1,384	483	34.9	57.16	66.11
NEFS 11	Halibut	4,074	1,384	483	34.9	17.28	15.1
NEFS 11	Wolffish	1,176	1,384	483	34.9	20.45	19.94

NEFS 12	GOM Cod	1,786	60	27	45	28.43	43.33
NEFS 12	Plaice	1,938	60	27	45	23.07	33.33
NEFS 12	GOM Winter Flounder	30	60	27	45	37.99	58.33
NEFS 12	Witch Flounder	316	60	27	45	41.85	61.67
NEFS 12	CC/GOM Yellowtail Flounder	2,776	60	27	45	40.72	61.67
NEFS 12	GOM Haddock	-	60	27	45		
NEFS 12	White Hake	-	60	27	45		
NEFS 12	Pollock	9	60	27	45	76.46	85
NEFS 12	Redfish	39	60	27	45	38.01	58.33
NEFS 12	Northern Windowpane	164	60	27	45	29.05	45
NEFS 12	Ocean Pout	3	60	27	45	74.72	85
NEFS 12	Halibut	9	60	27	45	73.73	83.33
NEFS 12	Wolffish	465	60	27	45	32.59	50
NEFS 13	GB Cod East	833	24	7	29.17	19.48	16.67
NEFS 13	GB Cod West	17,142	348	96	27.59	20.92	15.8
NEFS 13	GOM Cod	-	6	2	33.33		
NEFS 13	Plaice	16,694	377	98	25.99	37.3	35.28
NEFS 13	GB Winter Flounder	5,366	196	53	27.04	41.14	41.33
NEFS 13	GOM Winter Flounder	74	6	2	33.33	113.09	100
NEFS 13	Witch Flounder	6,359	377	98	25.99	30.96	27.32
NEFS 13	CC/GOM Yellowtail Flounder	4,066	43	17	39.53	80.43	83.72
NEFS 13	GB Yellowtail Flounder	14,719	196	53	27.04	23.35	18.37
NEFS 13	SNE/MA Yellowtail Flounder	4,032	134	41	30.6	25.29	23.88
NEFS 13	GB Haddock East	557	24	7	29.17	23.47	20.83
NEFS 13	GB Haddock West	2,524	348	96	27.59	29.42	27.01
NEFS 13	GOM Haddock	-	6	2	33.33		
NEFS 13	White Hake	4,748	377	98	25.99	46.29	45.62
NEFS 13	Pollock	743	377	98	25.99	72.1	67.11
NEFS 13	Redfish	6,374	377	98	25.99	44.93	44.3
NEFS 13	SNE/MA Winter Flounder	11,228	171	55	32.16	24.18	23.98
NEFS 13	Southern Windowpane	34,287	134	41	30.6	21.64	19.4
NEFS 13	Northern Windowpane	52,130	243	61	25.1	33.09	29.22
NEFS 13	Ocean Pout	20,220	377	98	25.99	32.58	29.44
NEFS 13	Halibut	3,360	377	98	25.99	26.33	21.49
NEFS 13	Wolffish	1,116	377	98	25.99	32.72	29.71

Table 2B: FY2011 Realized Groundfish Stock CV for Sector and Stock

Sector	Stock	Discards (lbs)	Number of strata sub-trips	Number observed sub-trips	Percent sub-trips observed	Realized stock CV	Percent observer coverage required for CV30
FIXED GEAR	GB Cod East	9306	31	5	16.13	23.97	12.9
FIXED GEAR	GB Cod West	29408	2381	624	26.21	14.26	7.43
FIXED GEAR	GOM Cod	24009	254	29	11.42	40.73	19.29
FIXED GEAR	Plaice	180	2666	662	24.83	18.17	10.84
FIXED GEAR	GB Winter Flounder	44	42	8	19.05	69.04	57.14
FIXED GEAR	GOM Winter Flounder	24	254	29	11.42	34.35	14.57
FIXED GEAR	Witch Flounder	4	2666	662	24.83	86.72	73.44
FIXED GEAR	CC/GOM Yellowtail Flounder	243	2376	597	25.13	31.36	26.85
FIXED GEAR	GB Yellowtail Flounder	35	42	8	19.05	53.57	45.24
FIXED GEAR	SNE/MA Yellowtail Flounder	0	248	55	22.18		
FIXED GEAR	GB Haddock East	13559	31	5	16.13	41.85	29.03
FIXED GEAR	GB Haddock West	2275	2381	624	26.21	29.25	25.24
FIXED GEAR	GOM Haddock	1564	254	29	11.42	45.29	22.83
FIXED GEAR	White Hake	4418	2666	662	24.83	16.22	8.81
FIXED GEAR	Pollock	18920	2666	662	24.83	17.43	10.05
FIXED GEAR	Redfish	333	2666	662	24.83	36	32.26
FIXED GEAR	SNE/MA Winter Flounder	2926	2370	620	26.16	14.5	7.68
FIXED GEAR	Southern Windowpane	0	248	55	22.18		
FIXED GEAR	Northern Windowpane	417	2418	608	25.14	18.61	11.46
FIXED GEAR	Ocean Pout	8699	2666	662	24.83	50.63	48.5
FIXED GEAR	Halibut	4942	2666	662	24.83	68.13	63.02
FIXED GEAR	Wolffish	4551	2666	662	24.83	17	9.6
NCCS	GB Cod West	42	18	0	0		
NCCS	GOM Cod	4350	60	14	23.33	13.36	6.67
NCCS	Plaice	58	78	14	17.95	23.38	12.82
NCCS	GOM Winter Flounder	0	60	14	23.33		
NCCS	Witch Flounder	19	78	14	17.95	23.94	12.82
NCCS	CC/GOM Yellowtail Flounder	0	60	14	23.33		
NCCS	SNE/MA Yellowtail Flounder	10	18	0	0		
NCCS	GB Haddock West	7	18	0	0		
NCCS	GOM Haddock	0	60	14	23.33		
NCCS	White Hake	7	78	14	17.95	23.94	12.82
NCCS	Pollock	33	78	14	17.95	27.69	16.67
NCCS	Redfish	44	78	14	17.95	23.94	12.82
NCCS	SNE/MA Winter Flounder	36	18	0	0		
NCCS	Southern Windowpane	136	18	0	0		
NCCS	Northern Windowpane	0	60	14	23.33		
NCCS	Ocean Pout	235	78	14	17.95	30.48	19.23
NCCS	Halibut	4	78	14	17.95	23.94	12.82
NCCS	Wolffish	180	78	14	17.95	46.76	35.9

PORT CYLDE	GB Cod West	28	1	1	100		
PORT CYLDE	GOM Cod	7544	765	195	25.49	10.31	3.92
PORT CYLDE	Plaice	11228	766	195	25.46	22.48	16.19
PORT CYLDE	GB Winter Flounder	0	1	1	100		
PORT CYLDE	GOM Winter Flounder	10	765	195	25.49	38.67	36.34
PORT CYLDE	Witch Flounder	9466	766	195	25.46	17.33	10.31
PORT CYLDE	CC/GOM Yellowtail Flounder	75	765	195	25.49	41.23	39.35
PORT CYLDE	GB Yellowtail Flounder	0	1	1	100		
PORT CYLDE	GB Haddock West	0	1	1	100		
PORT CYLDE	GOM Haddock	580	765	195	25.49	41.26	39.35
PORT CYLDE	White Hake	10411	766	195	25.46	13.27	6.27
PORT CYLDE	Pollock	23247	766	195	25.46	13.19	6.27
PORT CYLDE	Redfish	1817	766	195	25.46	18.26	11.36
PORT CYLDE	Northern Windowpane	0	766	195	25.46		
PORT CYLDE	Ocean Pout	9	766	195	25.46	86.56	74.02
PORT CYLDE	Halibut	3841	766	195	25.46	17.21	10.18
PORT CYLDE	Wolffish	1229	766	195	25.46	19.03	12.14
SUST HARV 1	GB Cod East	15729	194	54	27.84	30.83	29.38
SUST HARV 1	GB Cod West	48313	570	195	34.21	25.35	27.19
SUST HARV 1	GOM Cod	44129	1068	327	30.62	13.08	7.77
SUST HARV 1	Plaice	166124	1817	400	22.01	7.36	1.71
SUST HARV 1	GB Winter Flounder	1353	452	105	23.23	23.7	15.93
SUST HARV 1	GOM Winter Flounder	698	1068	327	30.62	25.71	24.53
SUST HARV 1	Witch Flounder	58295	1817	400	22.01	8.2	2.09
SUST HARV 1	CC/GOM Yellowtail Flounder	9089	1306	353	27.03	26.89	22.97
SUST HARV 1	GB Yellowtail Flounder	9765	452	105	23.23	21.87	13.94
SUST HARV 1	SNE/MA Yellowtail Flounder	3002	63	15	23.81	26.96	20.63
SUST HARV 1	GB Haddock East	48902	194	54	27.84	27.45	24.74
SUST HARV 1	GB Haddock West	22657	570	195	34.21	15.93	12.81
SUST HARV 1	GOM Haddock	2892	1068	327	30.62	11.71	6.37
SUST HARV 1	White Hake	5254	1817	400	22.01	24.18	15.52
SUST HARV 1	Pollock	60306	1817	400	22.01	16.35	7.76
SUST HARV 1	Redfish	247642	1817	400	22.01	13.37	5.34
SUST HARV 1	SNE/MA Winter Flounder	25722	312	151	48.4	31.72	51.28
SUST HARV 1	Southern Windowpane	13123	63	15	23.81	37.91	33.33
SUST HARV 1	Northern Windowpane	13465	1756	388	22.1	24.22	15.6
SUST HARV 1	Ocean Pout	8829	1817	400	22.01	14.43	6.16
SUST HARV 1	Halibut	21599	1817	400	22.01	8.69	2.37
SUST HARV 1	Wolffish	12800	1817	400	22.01	16.57	7.98

TRI-STATE	GB Cod West	1119	16	4	25	6.28	6.25
TRI-STATE	GOM Cod	751	41	9	21.95	15.89	7.32
TRI-STATE	Plaice	557	57	13	22.81	28.69	22.81
TRI-STATE	GB Winter Flounder	3	16	4	25	72.31	68.75
TRI-STATE	GOM Winter Flounder	12	41	9	21.95	18.33	9.76
TRI-STATE	Witch Flounder	74	57	13	22.81	36.8	31.58
TRI-STATE	CC/GOM Yellowtail Flounder	2132	41	9	21.95	21.72	14.63
TRI-STATE	GB Yellowtail Flounder	1093	16	4	25	29.1	25
TRI-STATE	GB Haddock West	1624	16	4	25	28.42	25
TRI-STATE	GOM Haddock	0	41	9	21.95		
TRI-STATE	White Hake	194	57	13	22.81	63.71	57.89
TRI-STATE	Pollock	194	57	13	22.81	91.59	73.68
TRI-STATE	Redfish	0	57	13	22.81		
TRI-STATE	Northern Windowpane	380	57	13	22.81	22.87	15.79
TRI-STATE	Ocean Pout	484	57	13	22.81	27.78	21.05
TRI-STATE	Halibut	118	57	13	22.81	63.43	57.89
TRI-STATE	Wolffish	184	57	13	22.81	38.97	33.33
NEFS 2	GB Cod East	16474	53	19	35.85	50.61	62.26
NEFS 2	GB Cod West	21441	295	95	32.2	21.13	19.32
NEFS 2	GOM Cod	98823	2172	540	24.86	9.22	3.04
NEFS 2	Plaice	102651	2520	564	22.38	9.14	2.62
NEFS 2	GB Winter Flounder	1954	134	39	29.1	33.21	33.58
NEFS 2	GOM Winter Flounder	3811	2172	540	24.86	16.64	9.25
NEFS 2	Witch Flounder	21361	2520	564	22.38	10.28	3.29
NEFS 2	CC/GOM Yellowtail Flounder	66613	2390	556	23.26	12.54	5.06
NEFS 2	GB Yellowtail Flounder	4333	134	39	29.1	43.65	47.01
NEFS 2	GB Haddock East	15365	53	19	35.85	32.73	41.51
NEFS 2	GB Haddock West	11221	295	95	32.2	28.77	30.51
NEFS 2	GOM Haddock	4461	2172	540	24.86	22.37	15.56
NEFS 2	White Hake	4723	2520	564	22.38	36.24	29.64
NEFS 2	Pollock	14534	2520	564	22.38	15.84	7.46
NEFS 2	Redfish	83468	2520	564	22.38	13.69	5.67
NEFS 2	SNE/MA Winter Flounder	797	216	84	38.89	44.84	58.8
NEFS 2	Northern Windowpane	30922	2520	564	22.38	11.06	3.81
NEFS 2	Ocean Pout	6379	2520	564	22.38	10.04	3.13
NEFS 2	Halibut	7097	2520	564	22.38	12.61	4.88
NEFS 2	Wolffish	29298	2520	564	22.38	11.4	4.01

FY 2011

NEFS 3	GB Cod West	23	195	38	19.49	53.92	44.1
NEFS 3	GOM Cod	60245	2921	950	32.52	5.27	1.47
NEFS 3	Plaice	2449	3116	986	31.64	11.63	6.51
NEFS 3	GOM Winter Flounder	764	2921	950	32.52	8.27	3.56
NEFS 3	Witch Flounder	512	3116	986	31.64	27.29	27.73
NEFS 3	CC/GOM Yellowtail Flounder	25304	2924	951	32.52	10.08	5.2
NEFS 3	SNE/MA Yellowtail Flounder	10	192	35	18.23	90.65	67.19
NEFS 3	GB Haddock West	3	195	38	19.49	90.82	69.23
NEFS 3	GOM Haddock	3431	2921	950	32.52	11.3	6.44
NEFS 3	White Hake	5524	3116	986	31.64	18.3	14.73
NEFS 3	Pollock	26944	3116	986	31.64	25.41	24.94
NEFS 3	Redfish	446	3116	986	31.64	14.83	10.17
NEFS 3	SNE/MA Winter Flounder	29	195	38	19.49	54.6	44.62
NEFS 3	Southern Windowpane	0	192	35	18.23		
NEFS 3	Northern Windowpane	3387	2924	951	32.52	10.88	5.98
NEFS 3	Ocean Pout	676	3116	986	31.64	16.73	12.61
NEFS 3	Halibut	4028	3116	986	31.64	13.73	8.86
NEFS 3	Wolffish	4642	3116	986	31.64	8.94	3.98
NEFS 5	GB Cod East	86	5	2	40	53.64	80
NEFS 5	GB Cod West	2046	651	212	32.57	20.62	18.59
NEFS 5	Plaice	2958	656	212	32.32	60.43	66.01
NEFS 5	GB Winter Flounder	6	24	3	12.5	54.94	33.33
NEFS 5	Witch Flounder	2480	656	212	32.32	18.18	14.94
NEFS 5	GB Yellowtail Flounder	1834	24	3	12.5	42.95	25
NEFS 5	SNE/MA Yellowtail Flounder	19330	632	209	33.07	12.27	7.75
NEFS 5	GB Haddock East	49	5	2	40	73.02	80
NEFS 5	GB Haddock West	929	651	212	32.57	39.86	46.08
NEFS 5	White Hake	251	656	212	32.32	32.75	36.28
NEFS 5	Pollock	7	656	212	32.32	51.18	58.23
NEFS 5	Redfish	0	656	212	32.32		
NEFS 5	SNE/MA Winter Flounder	66287	632	209	33.07	8.65	3.96
NEFS 5	Southern Windowpane	114399	632	209	33.07	10.38	5.7
NEFS 5	Northern Windowpane	4744	24	3	12.5	64.48	41.67
NEFS 5	Ocean Pout	35975	656	212	32.32	23.19	22.26
NEFS 5	Halibut	145	656	212	32.32	52.22	59.15
NEFS 5	Wolffish	0	656	212	32.32		

NEFS 6	GB Cod East	311	5	2	40	56.44	80
NEFS 6	GB Cod West	4901	86	27	31.4	34.38	38.37
NEFS 6	GOM Cod	5684	127	42	33.07	30.24	33.86
NEFS 6	Plaice	11115	218	43	19.72	22.04	11.93
NEFS 6	GB Winter Flounder	7	18	3	16.67	102.59	72.22
NEFS 6	GOM Winter Flounder	359	127	42	33.07	27.73	29.92
NEFS 6	Witch Flounder	3023	218	43	19.72	21.53	11.47
NEFS 6	CC/GOM Yellowtail Flounder	5213	199	43	21.61	24.23	15.58
NEFS 6	GB Yellowtail Flounder	362	18	3	16.67	67.15	55.56
NEFS 6	SNE/MA Yellowtail Flounder	14	1	0	0		
NEFS 6	GB Haddock East	516	5	2	40	39.16	60
NEFS 6	GB Haddock West	2154	86	27	31.4	40.23	45.35
NEFS 6	GOM Haddock	453	127	42	33.07	42.99	50.39
NEFS 6	White Hake	1752	218	43	19.72	39.66	30.28
NEFS 6	Pollock	2320	218	43	19.72	27.15	16.97
NEFS 6	Redfish	11979	218	43	19.72	21.85	11.93
NEFS 6	SNE/MA Winter Flounder	1545	73	26	35.62	65.63	72.6
NEFS 6	Southern Windowpane	187	1	0	0		
NEFS 6	Northern Windowpane	5782	217	43	19.82	26.65	16.59
NEFS 6	Ocean Pout	5744	218	43	19.72	32.74	22.94
NEFS 6	Halibut	3080	218	43	19.72	22.17	11.93
NEFS 6	Wolffish	1306	218	43	19.72	32.24	22.48
NEFS 7	GB Cod East	1545	19	7	36.84	17.98	21.05
NEFS 7	GB Cod West	8345	404	100	24.75	27.81	22.28
NEFS 7	GOM Cod	672	25	11	44	24.48	36
NEFS 7	Plaice	18135	447	110	24.61	18.53	11.19
NEFS 7	GB Winter Flounder	447	143	32	22.38	30.55	23.08
NEFS 7	GOM Winter Flounder	1	25	11	44	70.89	84
NEFS 7	Witch Flounder	5367	447	110	24.61	17.2	9.84
NEFS 7	CC/GOM Yellowtail Flounder	3	70	18	25.71	82.15	72.86
NEFS 7	GB Yellowtail Flounder	6357	143	32	22.38	21.89	13.99
NEFS 7	SNE/MA Yellowtail Flounder	4986	235	65	27.66	37.03	37.02
NEFS 7	GB Haddock East	374	19	7	36.84	12.93	10.53
NEFS 7	GB Haddock West	5498	404	100	24.75	58.18	55.45
NEFS 7	GOM Haddock	41	25	11	44	30.75	48
NEFS 7	White Hake	2730	447	110	24.61	40.18	37.14
NEFS 7	Pollock	2935	447	110	24.61	44.42	41.83
NEFS 7	Redfish	1283	447	110	24.61	50.61	48.32
NEFS 7	SNE/MA Winter Flounder	7765	280	73	26.07	44.34	43.57
NEFS 7	Southern Windowpane	3869	235	65	27.66	40.17	40.85
NEFS 7	Northern Windowpane	28397	213	47	22.07	17.83	9.39
NEFS 7	Ocean Pout	3576	447	110	24.61	33.75	29.31
NEFS 7	Halibut	2661	447	110	24.61	21.81	14.77
NEFS 7	Wolffish	463	447	110	24.61	29.48	24.16

FY 2011

NEFS 8	GB Cod East	4452	33	19	57.58	23.35	45.45
NEFS 8	GB Cod West	9451	161	37	22.98	20.84	13.04
NEFS 8	GOM Cod	1068	13	6	46.15	51.29	76.92
NEFS 8	Plaice	13506	212	45	21.23	24.27	15.09
NEFS 8	GB Winter Flounder	1362	140	38	27.14	35.44	34.29
NEFS 8	GOM Winter Flounder	599	13	6	46.15	40.9	61.54
NEFS 8	Witch Flounder	6639	212	45	21.23	23.18	14.15
NEFS 8	CC/GOM Yellowtail Flounder	1239	52	18	34.62	62.37	71.15
NEFS 8	GB Yellowtail Flounder	18574	140	38	27.14	23.98	19.29
NEFS 8	SNE/MA Yellowtail Flounder	0	19	6	31.58		
NEFS 8	GB Haddock East	2784	33	19	57.58	21.28	42.42
NEFS 8	GB Haddock West	4335	161	37	22.98	23.27	15.53
NEFS 8	GOM Haddock	0	13	6	46.15		
NEFS 8	White Hake	3825	212	45	21.23	47.22	40.09
NEFS 8	Pollock	212	212	45	21.23	33.84	25.94
NEFS 8	Redfish	2683	212	45	21.23	32.42	24.06
NEFS 8	SNE/MA Winter Flounder	4836	58	21	36.21	56.26	67.24
NEFS 8	Southern Windowpane	0	19	6	31.58		
NEFS 8	Northern Windowpane	33012	193	44	22.8	28.14	20.73
NEFS 8	Ocean Pout	8820	212	45	21.23	27.41	18.4
NEFS 8	Halibut	2853	212	45	21.23	23.61	14.62
NEFS 8	Wolffish	719	212	45	21.23	36.91	29.25
NEFS 9	GB Cod East	22021	79	26	32.91	17.64	15.19
NEFS 9	GB Cod West	117093	585	137	23.42	16.76	8.72
NEFS 9	GOM Cod	10523	107	33	30.84	34.14	37.38
NEFS 9	Plaice	83820	771	140	18.16	11.87	3.37
NEFS 9	GB Winter Flounder	23810	409	110	26.89	33.82	32.03
NEFS 9	GOM Winter Flounder	905	107	33	30.84	35.3	38.32
NEFS 9	Witch Flounder	23397	771	140	18.16	17.71	7.26
NEFS 9	CC/GOM Yellowtail Flounder	13891	309	91	29.45	25.49	23.3
NEFS 9	GB Yellowtail Flounder	51084	409	110	26.89	17.23	11
NEFS 9	SNE/MA Yellowtail Flounder	1663	53	18	33.96	63.09	69.81
NEFS 9	GB Haddock East	8320	79	26	32.91	19.34	17.72
NEFS 9	GB Haddock West	30245	585	137	23.42	19.88	11.97
NEFS 9	GOM Haddock	1049	107	33	30.84	58.89	63.55
NEFS 9	White Hake	13708	771	140	18.16	24.63	13.1
NEFS 9	Pollock	4889	771	140	18.16	25.9	14.27
NEFS 9	Redfish	54833	771	140	18.16	19.75	8.82
NEFS 9	SNE/MA Winter Flounder	59329	255	89	34.9	36.66	44.71
NEFS 9	Southern Windowpane	2668	53	18	33.96	48.08	58.49
NEFS 9	Northern Windowpane	155056	718	139	19.36	17.27	7.38
NEFS 9	Ocean Pout	27069	771	140	18.16	14.23	4.8
NEFS 9	Halibut	11217	771	140	18.16	19.54	8.69
NEFS 9	Wolffish	4798	771	140	18.16	22.67	11.28

NEFS 10	GB Cod West	1627	166	48	28.92	28.3	27.11
NEFS 10	GOM Cod	37435	950	341	35.89	9.53	5.37
NEFS 10	Plaice	12057	1116	388	34.77	11.91	7.8
NEFS 10	GB Winter Flounder	0	5	1	20		
NEFS 10	GOM Winter Flounder	3662	950	341	35.89	17.26	15.68
NEFS 10	Witch Flounder	1838	1116	388	34.77	15.18	12.01
NEFS 10	CC/GOM Yellowtail Flounder	55661	1076	376	34.94	15.02	11.9
NEFS 10	GB Yellowtail Flounder	0	5	1	20		
NEFS 10	SNE/MA Yellowtail Flounder	0	35	12	34.29		
NEFS 10	GB Haddock West	188	166	48	28.92	48.48	51.81
NEFS 10	GOM Haddock	582	950	341	35.89	18.98	18.32
NEFS 10	White Hake	2915	1116	388	34.77	37.33	45.25
NEFS 10	Pollock	11865	1116	388	34.77	31.43	36.92
NEFS 10	Redfish	732	1116	388	34.77	25.11	27.24
NEFS 10	SNE/MA Winter Flounder	1834	161	48	29.81	28.78	28.57
NEFS 10	Southern Windowpane	2	35	12	34.29	83.32	82.86
NEFS 10	Northern Windowpane	28101	1081	376	34.78	18.01	16.19
NEFS 10	Ocean Pout	4900	1116	388	34.77	17.64	15.59
NEFS 10	Halibut	2042	1116	388	34.77	18.15	16.4
NEFS 10	Wolffish	9013	1116	388	34.77	27.95	31.72
NEFS 11	GB Cod West	0	142	23	16.2		
NEFS 11	GOM Cod	19529	1547	423	27.34	8.21	2.78
NEFS 11	Plaice	5973	1689	446	26.41	13.6	6.87
NEFS 11	GOM Winter Flounder	187	1547	423	27.34	16.64	10.41
NEFS 11	Witch Flounder	698	1689	446	26.41	11.53	5.09
NEFS 11	CC/GOM Yellowtail Flounder	4063	1547	423	27.34	29.52	26.76
NEFS 11	SNE/MA Yellowtail Flounder	0	142	23	16.2		
NEFS 11	GB Haddock West	0	142	23	16.2		
NEFS 11	GOM Haddock	1110	1547	423	27.34	19.61	13.9
NEFS 11	White Hake	3165	1689	446	26.41	14	7.28
NEFS 11	Pollock	27898	1689	446	26.41	22.07	16.28
NEFS 11	Redfish	1477	1689	446	26.41	20.33	14.15
NEFS 11	SNE/MA Winter Flounder	0	142	23	16.2		
NEFS 11	Southern Windowpane	12	142	23	16.2	65.56	48.59
NEFS 11	Northern Windowpane	697	1547	423	27.34	24.22	19.72
NEFS 11	Ocean Pout	254	1689	446	26.41	44.17	43.75
NEFS 11	Halibut	1916	1689	446	26.41	28.38	24.33
NEFS 11	Wolffish	1227	1689	446	26.41	21.72	15.87

FY 2011

NEFS 12	GB Cod West	242	38	10	26.32	75.97	71.05
NEFS 12	GOM Cod	7390	241	62	25.73	25.74	20.33
NEFS 12	Plaice	3030	279	71	25.45	26.15	20.79
NEFS 12	GB Winter Flounder	0	3	1	33.33		
NEFS 12	GOM Winter Flounder	56	241	62	25.73	49.57	48.96
NEFS 12	Witch Flounder	293	279	71	25.45	25.4	19.71
NEFS 12	CC/GOM Yellowtail Flounder	5034	241	62	25.73	39.31	37.34
NEFS 12	GB Yellowtail Flounder	0	3	1	33.33		
NEFS 12	SNE/MA Yellowtail Flounder	0	35	9	25.71		
NEFS 12	GB Haddock West	17	38	10	26.32	75.97	71.05
NEFS 12	GOM Haddock	289	241	62	25.73	18.71	12.03
NEFS 12	White Hake	10296	279	71	25.45	24.77	19
NEFS 12	Pollock	48725	279	71	25.45	19.51	12.9
NEFS 12	Redfish	1860	279	71	25.45	20.61	13.98
NEFS 12	SNE/MA Winter Flounder	0	35	9	25.71		
NEFS 12	Southern Windowpane	0	35	9	25.71		
NEFS 12	Northern Windowpane	621	244	62	25.41	39.04	36.89
NEFS 12	Ocean Pout	33	279	71	25.45	53.11	51.97
NEFS 12	Halibut	377	279	71	25.45	32.36	28.67
NEFS 12	Wolffish	497	279	71	25.45	41.63	39.78
NEFS 13	GB Cod East	3551	62	18	29.03	31.28	32.26
NEFS 13	GB Cod West	7261	521	143	27.45	20	14.4
NEFS 13	GOM Cod	299	29	4	13.79	57.35	37.93
NEFS 13	Plaice	9297	612	147	24.02	23.12	15.85
NEFS 13	GB Winter Flounder	377	256	54	21.09	34.87	26.56
NEFS 13	GOM Winter Flounder	0	29	4	13.79		
NEFS 13	Witch Flounder	6639	612	147	24.02	17.09	9.31
NEFS 13	CC/GOM Yellowtail Flounder	236	77	26	33.77	59.55	67.53
NEFS 13	GB Yellowtail Flounder	12387	256	54	21.09	23.64	14.45
NEFS 13	SNE/MA Yellowtail Flounder	10869	279	91	32.62	19.37	16.85
NEFS 13	GB Haddock East	3268	62	18	29.03	24.43	22.58
NEFS 13	GB Haddock West	7548	521	143	27.45	21.62	16.51
NEFS 13	GOM Haddock	29	29	4	13.79	61.21	41.38
NEFS 13	White Hake	2917	612	147	24.02	36.17	31.54
NEFS 13	Pollock	207	612	147	24.02	39.4	35.29
NEFS 13	Redfish	6451	612	147	24.02	23.77	16.67
NEFS 13	SNE/MA Winter Flounder	18459	327	112	34.25	16.68	14.07
NEFS 13	Southern Windowpane	42812	279	91	32.62	15.66	11.83
NEFS 13	Northern Windowpane	43808	333	61	18.32	23.04	11.71
NEFS 13	Ocean Pout	18007	612	147	24.02	28.47	22.22
NEFS 13	Halibut	2977	612	147	24.02	20.64	13.07
NEFS 13	Wolffish	15S6	612	147	24.02	30.66	24.84

Enclosure (3)
Groundfish PDT report dated July 27, 2012

Effect of CV and Bias on Sector Catch Estimates

The goal of monitoring discards in sectors is to make sure there is an accurate accounting of sector catches. The level of needed observer coverage depends on the desired degree of catch accuracy.

The sector and stock-specific CV of discard estimates can be used to characterize the likelihood that the actual catches exceed a sector's ACE. The following discussion uses these assumptions:

- Landings are known without error. This assumption could be relaxed if information is available on the uncertainty surrounding landings.
- Discard estimates are unbiased. This assumption will be modified in a subsequent discussion.
- Discard estimates are normally distributed random variables.

CV is normally defined as the standard deviation (SD) of an estimate divided by the mean of the estimate. In the SBRM framework, however, CV is defined as the standard error of the estimate divided by the estimate. CV is a dimension-less value. If the CV and point estimate of the discards are known, then the SE can be determined as:

CV= SE of the estimate/ estimate
CV * estimate = SE

This relationship allows creation of a confidence interval around any discard estimate. The interval that is plus/minus 1.96 * SE of the estimate will cover 95 pct of the distribution. There is a 97.5 pct probability that the discard estimate will be equal to or less than the mean plus 1.96 times the SE. With discards at a given proportion of the catch, the SE can be used to determine the upper bound of the confidence interval, shown in Table 1.

Any discard estimate can be expressed as a proportion of a sector's nominal catch (landings plus the discard estimate); landings can also be expressed as a proportion of the nominal catch. If, as assumed, landings are known without error and the discard estimate is unbiased, then the CV of the discard estimate can be used to calculate a catch that has a 97.5 pct probability of being less than or equal to the actual catch:

$$Catch_{98\ pct} = Landings + Discards + (Discards * 1.96 * CV)$$

The result of this formula will always be equal to or greater than 1, because both landings and discards are being expressed as a proportion of catch. The catch increases as discards increase and CV increases. Results are shown in Table 2.

At what point does the $Catch_{UpperCI}$ exceed the sector's ACE? This would occur when the actual catch, as a proportion of the ACE, exceeds 1. This can be determined for each cell in Table 2 by dividing 1 by the $Catch_{UpperCI}$. This gives the nominal catch, as a proportion of ACE, above which the sector ACE may be exceeded for a given discard rate and CV. This ACE is referred to as ACE_{max}.The results are shown in Table 3.

Table 4 gives the results if the criterion is that ACE not be exceeded with a probability of about 84 pct, based on one standard deviation of the SE of the discard estimate.

Discussion – Unbiased Estimates of Discards

From the standpoint of monitoring sector discards to make certain that catches remain under the ACE allocated, both the CV of the discard estimate and the proportion of the catch that is discarded are important. Sector nominal catches can be a higher percentage of ACE without risk of exceeding the ACE if the CV is reduced and/or the discards as a percentage of the sector catch area reduced. This gives a potential way to evaluate the costs of improving (decreasing) the CV at a given level of discards. For example, if discards are about 10 percent of the catch, then improving the CV by 5 percent increases the ACE_{max} (as a proportion of ACE) by about 1 percent. The increased value of this catch could be compared to the cost of improving the CV to determine if it is worthwhile.

The previous analysis assumes that discards are unbiased.

At a given CV, each 5 percent reduction in discards increases the ACE_{max} by more than occurs with a 5 percent improvement in CV.

In FY 2010, the discards of most stocks in individual sectors were in the range of 0 to 15 per cent, with a few exceptions (most notably, stocks where discards were required).

Biased Discard Estimates

The previous analysis assumes that discards are unbiased. The implications of biased discard estimates can be explored by assuming that the true discard estimate is a multiple of the nominal discard estimate. For example, if nominal discards are estimated to be 0.1 of the catch, then the actual discards were assumed to be twice this amount - a doubling of the estimate. The implications of this on actual catch can be explored, including the effects that a bias assumption has on the amount of ACE_{max} . This approach assumes the CV remains accurate for the revised discard estimate.

Results are shown for a bias multiplier of 2 in Table 5 through Table 7. The presence of a bias results in a reduction in the ACE_{max}. Figure 1 compares the results of two bias multipliers to the no bias result when the nominal discards are 10 percent of the nominal catch. Figure 2 compares the maximum nominal catch for different nominal discard rates with a bias multiplier of 2.

Enclosure (3)
Groundfish PDT report dated July 27, 2012

Discussion – Biased Discard Estimates

If discard estimates are biased then nominal catches need to be lower to have a high probability that the ACE is not exceeded. The CV of the discard estimate also becomes more important, as can be seen from Figure 2. If discard estimates are not biased, changing the CV of the discard estimate from 0.55 to 0.3 only increases the ACE_{max} by 0.41 percent. If the discards are under-estimated by a factor of 2, then a similar change in CV increases the ACE_{max} by 0.061 percent . Put another way, if discard estimates are not biased, then at a discard rate of 10 pct of the catch, reducing the CV by 5 percent increases ACE_{max} by about 0.009. If discards are biased and nominal discards are the same, then improving the CV by 5 percent increases ACE_{max} by about 1.4 percent (with a range of 1.1 percent to1.6 percent for CVs of 0.55 to 0).

Using the FY 2010 sector sub-ACLs and average prices per species, the value of increasing the ACE_{max} by 0.009 can be calculated as $2.2 million (if GB haddock and redfish are included) or $840,000 if these two stocks are excluded (because catches are far lower than the quotas). With an estimate of the increased costs of observer coverage to achieve this change, a determination can be made whether the improved CV is cost effective. This estimate is likely an over-estimate for FY 2010, because in most cases the catches, as a percent of the sub-ACL, were lower than the ACE_{max} values for discards at 10 percent of catch.

Bias – An Exploration

In simple terms, total discards of a stock (Dt) by a sector are estimated as a combination of the observed discards on an observed trip (Do)and the unobserved discards on unobserved trips (Du). The discards for unobserved trips are estimated based on the ratio of discards of the stock to the total kept catch on the observed trips (do/ko); this ratio is multiplied by the total kept catch on the unobserved trips (ku)[1].

$$Dt = Do + Du$$

$$Dt = Do + (do/ko)*ku$$

If it is suspected that there is a bias in the discard estimate, then the true discards are some multiple of the estimated discards.

$$\text{True Discards} = X * Dt = X (Do + (do*ku/ko))$$

[1] This discussion simplifies the actual discard calculation for clarity.

Because Do is known, and ku is known, if there is a bias in a discard estimate for a stock it is because the discard ratio on unobserved trips differs from the do/ko used to estimate discards. It should be emphasized that this represents a change in rate, not just an increase of decrease in the amount discarded. In other words, if bias is present:

$$du/ku = Y*do/ko$$

where Y is a bias multiplier

$$x*Dt=Do+ Y*do/ko*ku$$

Since Do, do/ko, and ku do not change, the factor Y can be determined if the bias factor is either known or assumed:

$$(x*Dt-Do)/(do*ku/ko) = Y$$

This relationship provides a way to determine, for a given suspected bias in the discard estimate, how much the discard ratio on unobserved trips differs from the discard ratio on observed trips. The difference between the ratios increases as the suspected bias increases, and also increases as the proportion of observed kept catch increases. The relative difference is not dependent on the observed discard rate; it is dependent on the observer coverage level, expressed as the ratio of observed kept catch to unobserved kept catch.

If a positive bias is suspected (true discards exceed estimated discards), the discard ratio on unobserved trips must be higher than the discard ratio on the observed trips (Figure 3). At a minimum it must be the same as the suspected bias, and at low coverage levels (up to 25 percent) it differs from this amount by only a few percent. As coverage increases, the relative discard rate difference becomes larger than the suspected bias multiplier. At coverage levels of 50 percent and above, the discard rate must be dramatically different than the suspected bias. For example, at 50 percent coverage and with a suspected bias multiplier of three, the discard rate on unobserved trips must be five times the discard rate on observed trips.

For fishing behavior to be sufficiently different on unobserved trips to lead to a bias in the discard estimate, there must be a benefit – real or perceived – to the change in behavior. One possibility might be high-grading - discarding lower value catch in order to retain more valuable catch at a given weight. With multiple stocks, another rationale would be if the increased discarding on unobserved trips allows increased revenues from other stocks. This would seem more likely if there are stocks with low quotas that are limiting fishing activity by sector vessels.

Enclosure (3)
Groundfish PDT report dated July 27, 2012

Enclosure (3)
Groundfish PDT report dated July 27, 2012

Table 1 – Discards plus 1.96* SE of discards as a percent of catch

	CV											
Nominal Discards as Pct of Catch	0	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.55
0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.05	0.050	0.055	0.060	0.065	0.070	0.075	0.079	0.084	0.089	0.094	0.099	0.104
0.1	0.100	0.110	0.120	0.129	0.139	0.149	0.159	0.169	0.178	0.188	0.198	0.208
0.15	0.150	0.165	0.179	0.194	0.209	0.224	0.238	0.253	0.268	0.282	0.297	0.312
0.2	0.200	0.220	0.239	0.259	0.278	0.298	0.318	0.337	0.357	0.376	0.396	0.416
0.25	0.250	0.275	0.299	0.324	0.348	0.373	0.397	0.422	0.446	0.471	0.495	0.520
0.3	0.300	0.329	0.359	0.388	0.418	0.447	0.476	0.506	0.535	0.565	0.594	0.623
0.35	0.350	0.384	0.419	0.453	0.487	0.522	0.556	0.590	0.624	0.659	0.693	0.727
0.4	0.400	0.439	0.478	0.518	0.557	0.596	0.635	0.674	0.714	0.753	0.792	0.831
0.45	0.450	0.494	0.538	0.582	0.626	0.671	0.715	0.759	0.803	0.847	0.891	0.935
0.5	0.500	0.549	0.598	0.647	0.696	0.745	0.794	0.843	0.892	0.941	0.990	1.039
0.55	0.550	0.604	0.658	0.712	0.766	0.820	0.873	0.927	0.981	1.035	1.089	1.143
0.6	0.600	0.659	0.718	0.776	0.835	0.894	0.953	1.012	1.070	1.129	1.188	1.247
0.65	0.650	0.714	0.777	0.841	0.905	0.969	1.032	1.096	1.160	1.223	1.287	1.351
0.7	0.700	0.769	0.837	0.906	0.974	1.043	1.112	1.180	1.249	1.317	1.386	1.455
0.75	0.750	0.824	0.897	0.971	1.044	1.118	1.191	1.265	1.338	1.412	1.485	1.559
0.8	0.800	0.878	0.957	1.035	1.114	1.192	1.270	1.349	1.427	1.506	1.584	1.662
0.85	0.850	0.933	1.017	1.100	1.183	1.267	1.350	1.433	1.516	1.600	1.683	1.766
0.9	0.900	0.988	1.076	1.165	1.253	1.341	1.429	1.517	1.606	1.694	1.782	1.870
0.95	0.950	1.043	1.136	1.229	1.322	1.416	1.509	1.602	1.695	1.788	1.881	1.974
1	1.000	1.098	1.196	1.294	1.392	1.490	1.588	1.686	1.784	1.882	1.980	2.078

Enclosure (3)
Groundfish PDT report dated July 27, 2012

Table 2 – Landings plus discards plus 1.96 times SE of discards as a percent of catch

	CV											
Landings as Pct of Catch	0	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.55
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
0.95	1.000	1.005	1.010	1.015	1.020	1.025	1.029	1.034	1.039	1.044	1.049	1.054
0.9	1.000	1.010	1.020	1.029	1.039	1.049	1.059	1.069	1.078	1.088	1.098	1.108
0.85	1.000	1.015	1.029	1.044	1.059	1.074	1.088	1.103	1.118	1.132	1.147	1.162
0.8	1.000	1.020	1.039	1.059	1.078	1.098	1.118	1.137	1.157	1.176	1.196	1.216
0.75	1.000	1.025	1.049	1.074	1.098	1.123	1.147	1.172	1.196	1.221	1.245	1.270
0.7	1.000	1.029	1.059	1.088	1.118	1.147	1.176	1.206	1.235	1.265	1.294	1.323
0.65	1.000	1.034	1.069	1.103	1.137	1.172	1.206	1.240	1.274	1.309	1.343	1.377
0.6	1.000	1.039	1.078	1.118	1.157	1.196	1.235	1.274	1.314	1.353	1.392	1.431
0.55	1.000	1.044	1.088	1.132	1.176	1.221	1.265	1.309	1.353	1.397	1.441	1.485
0.5	1.000	1.049	1.098	1.147	1.196	1.245	1.294	1.343	1.392	1.441	1.490	1.539
0.45	1.000	1.054	1.108	1.162	1.216	1.270	1.323	1.377	1.431	1.485	1.539	1.593
0.4	1.000	1.059	1.118	1.176	1.235	1.294	1.353	1.412	1.470	1.529	1.588	1.647
0.35	1.000	1.064	1.127	1.191	1.255	1.319	1.382	1.446	1.510	1.573	1.637	1.701
0.3	1.000	1.069	1.137	1.206	1.274	1.343	1.412	1.480	1.549	1.617	1.686	1.755
0.25	1.000	1.074	1.147	1.221	1.294	1.368	1.441	1.515	1.588	1.662	1.735	1.809
0.2	1.000	1.078	1.157	1.235	1.314	1.392	1.470	1.549	1.627	1.706	1.784	1.862
0.15	1.000	1.083	1.167	1.250	1.333	1.417	1.500	1.583	1.666	1.750	1.833	1.916
0.1	1.000	1.088	1.176	1.265	1.353	1.441	1.529	1.617	1.706	1.794	1.882	1.970
0.05	1.000	1.093	1.186	1.279	1.372	1.466	1.559	1.652	1.745	1.838	1.931	2.024
0	1.000	1.098	1.196	1.294	1.392	1.490	1.588	1.686	1.784	1.882	1.980	2.078

Enclosure (3)
Groundfish PDT report dated July 27, 2012

Table 3 - Maximum Nominal Catch Where Actual Catch < ACE With a Probability of 97.5 pct

	CV											
Discards as Pct of Catch	0	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.55
0	1	1	1	1	1	1	1	1	1	1	1	1
0.05	1	0.995	0.990	0.986	0.981	0.976	0.971	0.967	0.962	0.958	0.953	0.949
0.1	1	0.990	0.981	0.971	0.962	0.953	0.944	0.936	0.927	0.919	0.911	0.903
0.15	1	0.986	0.971	0.958	0.944	0.932	0.919	0.907	0.895	0.883	0.872	0.861
0.2	1	0.981	0.962	0.944	0.927	0.911	0.895	0.879	0.864	0.850	0.836	0.823
0.25	1	0.976	0.953	0.932	0.911	0.891	0.872	0.854	0.836	0.819	0.803	0.788
0.3	1	0.971	0.944	0.919	0.895	0.872	0.850	0.829	0.810	0.791	0.773	0.756
0.35	1	0.967	0.936	0.907	0.879	0.854	0.829	0.806	0.785	0.764	0.745	0.726
0.4	1	0.962	0.927	0.895	0.864	0.836	0.810	0.785	0.761	0.739	0.718	0.699
0.45	1	0.958	0.919	0.883	0.850	0.819	0.791	0.764	0.739	0.716	0.694	0.673
0.5	1	0.953	0.911	0.872	0.836	0.803	0.773	0.745	0.718	0.694	0.671	0.650
0.55	1	0.949	0.903	0.861	0.823	0.788	0.756	0.726	0.699	0.673	0.650	0.628
0.6	1	0.944	0.895	0.850	0.810	0.773	0.739	0.708	0.680	0.654	0.630	0.607
0.65	1	0.940	0.887	0.840	0.797	0.758	0.723	0.692	0.662	0.636	0.611	0.588
0.7	1	0.936	0.879	0.829	0.785	0.745	0.708	0.676	0.646	0.618	0.593	0.570
0.75	1	0.932	0.872	0.819	0.773	0.731	0.694	0.660	0.630	0.602	0.576	0.553
0.8	1	0.927	0.864	0.810	0.761	0.718	0.680	0.646	0.615	0.586	0.561	0.537
0.85	1	0.923	0.857	0.800	0.750	0.706	0.667	0.632	0.600	0.572	0.546	0.522
0.9	1	0.919	0.850	0.791	0.739	0.694	0.654	0.618	0.586	0.557	0.531	0.508
0.95	1	0.915	0.843	0.782	0.729	0.682	0.642	0.605	0.573	0.544	0.518	0.494
1	1	0.911	0.836	0.773	0.718	0.671	0.630	0.593	0.561	0.531	0.505	0.481

Table 4 - Maximum Nominal Catch Where Actual Catch < ACE With a Probability of 84 pct

	CV											
Discards as Pct of Catch	0	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.55
0	1	1	1	1	1	1	1	1	1	1	1	1
0.05	1	0.998	0.995	0.993	0.990	0.988	0.985	0.983	0.980	0.978	0.976	0.973
0.1	1	0.995	0.990	0.985	0.980	0.976	0.971	0.966	0.962	0.957	0.952	0.948
0.15	1	0.993	0.985	0.978	0.971	0.964	0.957	0.950	0.943	0.937	0.930	0.924
0.2	1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909	0.901
0.25	1	0.988	0.976	0.964	0.952	0.941	0.930	0.920	0.909	0.899	0.889	0.879
0.3	1	0.985	0.971	0.957	0.943	0.930	0.917	0.905	0.893	0.881	0.870	0.858
0.35	1	0.983	0.966	0.950	0.935	0.920	0.905	0.891	0.877	0.864	0.851	0.839
0.4	1	0.980	0.962	0.943	0.926	0.909	0.893	0.877	0.862	0.847	0.833	0.820
0.45	1	0.978	0.957	0.937	0.917	0.899	0.881	0.864	0.847	0.832	0.816	0.802
0.5	1	0.976	0.952	0.930	0.909	0.889	0.870	0.851	0.833	0.816	0.800	0.784
0.55	1	0.973	0.948	0.924	0.901	0.879	0.858	0.839	0.820	0.802	0.784	0.768
0.6	1	0.971	0.943	0.917	0.893	0.870	0.847	0.826	0.806	0.787	0.769	0.752
0.65	1	0.969	0.939	0.911	0.885	0.860	0.837	0.815	0.794	0.774	0.755	0.737
0.7	1	0.966	0.935	0.905	0.877	0.851	0.826	0.803	0.781	0.760	0.741	0.722
0.75	1	0.964	0.930	0.899	0.870	0.842	0.816	0.792	0.769	0.748	0.727	0.708
0.8	1	0.962	0.926	0.893	0.862	0.833	0.806	0.781	0.758	0.735	0.714	0.694
0.85	1	0.959	0.922	0.887	0.855	0.825	0.797	0.771	0.746	0.723	0.702	0.681
0.9	1	0.957	0.917	0.881	0.847	0.816	0.787	0.760	0.735	0.712	0.690	0.669
0.95	1	0.955	0.913	0.875	0.840	0.808	0.778	0.750	0.725	0.701	0.678	0.657
1	1	0.952	0.909	0.870	0.833	0.800	0.769	0.741	0.714	0.690	0.667	0.645

Enclosure (3)
Groundfish PDT report dated July 27, 2012

Table 5 – Discards plus 1.96 times SE as a percent of nominal catch; bias multiplier of 2 (nominal discards are half true discards)

	CV											
Nominal discards as a Pct of Catch	0	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.55
0	0	0	0	0	0	0	0	0	0	0	0	0
0.05	0.100	0.110	0.120	0.129	0.139	0.149	0.159	0.169	0.178	0.188	0.198	0.208
0.1	0.200	0.220	0.239	0.259	0.278	0.298	0.318	0.337	0.357	0.376	0.396	0.416
0.15	0.300	0.329	0.359	0.388	0.418	0.447	0.476	0.506	0.535	0.565	0.594	0.623
0.2	0.400	0.439	0.478	0.518	0.557	0.596	0.635	0.674	0.714	0.753	0.792	0.831
0.25	0.500	0.549	0.598	0.647	0.696	0.745	0.794	0.843	0.892	0.941	0.990	1.039
0.3	0.600	0.659	0.718	0.776	0.835	0.894	0.953	1.012	1.070	1.129	1.188	1.247
0.35	0.700	0.769	0.837	0.906	0.974	1.043	1.112	1.180	1.249	1.317	1.386	1.455
0.4	0.800	0.878	0.957	1.035	1.114	1.192	1.270	1.349	1.427	1.506	1.584	1.662
0.45	0.900	0.988	1.076	1.165	1.253	1.341	1.429	1.517	1.606	1.694	1.782	1.870
0.5	1.000	1.098	1.196	1.294	1.392	1.490	1.588	1.686	1.784	1.882	1.980	2.078
0.55	1.100	1.208	1.316	1.423	1.531	1.639	1.747	1.855	1.962	2.070	2.178	2.286
0.6	1.200	1.318	1.435	1.553	1.670	1.788	1.906	2.023	2.141	2.258	2.376	2.494
0.65	1.300	1.427	1.555	1.682	1.810	1.937	2.064	2.192	2.319	2.447	2.574	2.701
0.7	1.400	1.537	1.674	1.812	1.949	2.086	2.223	2.360	2.498	2.635	2.772	2.909
0.75	1.500	1.647	1.794	1.941	2.088	2.235	2.382	2.529	2.676	2.823	2.970	3.117
0.8	1.600	1.757	1.914	2.070	2.227	2.384	2.541	2.698	2.854	3.011	3.168	3.325
0.85	1.700	1.867	2.033	2.200	2.366	2.533	2.700	2.866	3.033	3.199	3.366	3.533
0.9	1.800	1.976	2.153	2.329	2.506	2.682	2.858	3.035	3.211	3.388	3.564	3.740
0.95	1.900	2.086	2.272	2.459	2.645	2.831	3.017	3.203	3.390	3.576	3.762	3.948
1	2.000	2.196	2.392	2.588	2.784	2.980	3.176	3.372	3.568	3.764	3.960	4.156

Table 6 – Landings plus discards plus 1.96 times SE of discards, as a percent of nominal catch; bias multiplier of 2

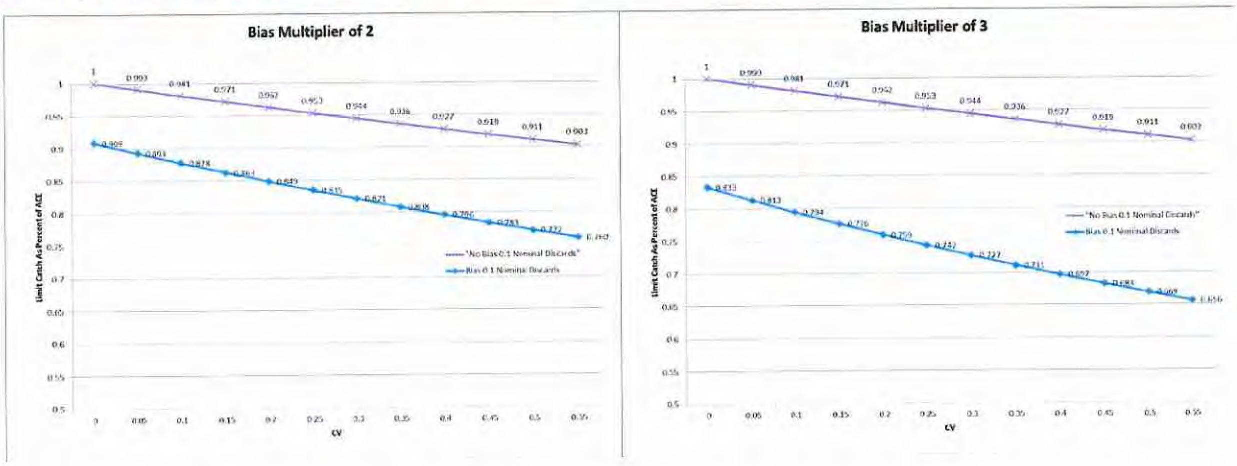
	CV											
Landings as Pct of Nominal Catch	0	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.55
1	1	1	1	1	1	1	1	1	1	1	1	1
0.95	1.050	1.060	1.070	1.079	1.089	1.099	1.109	1.119	1.128	1.138	1.148	1.158
0.9	1.100	1.120	1.139	1.159	1.178	1.198	1.218	1.237	1.257	1.276	1.296	1.316
0.85	1.150	1.179	1.209	1.238	1.268	1.297	1.326	1.356	1.385	1.415	1.444	1.473
0.8	1.200	1.239	1.278	1.318	1.357	1.396	1.435	1.474	1.514	1.553	1.592	1.631
0.75	1.250	1.299	1.348	1.397	1.446	1.495	1.544	1.593	1.642	1.691	1.740	1.789
0.7	1.300	1.359	1.418	1.476	1.535	1.594	1.653	1.712	1.770	1.829	1.888	1.947
0.65	1.350	1.419	1.487	1.556	1.624	1.693	1.762	1.830	1.899	1.967	2.036	2.105
0.6	1.400	1.478	1.557	1.635	1.714	1.792	1.870	1.949	2.027	2.106	2.184	2.262
0.55	1.450	1.538	1.626	1.715	1.803	1.891	1.979	2.067	2.156	2.244	2.332	2.420
0.5	1.500	1.598	1.696	1.794	1.892	1.990	2.088	2.186	2.284	2.382	2.480	2.578
0.45	1.550	1.658	1.766	1.873	1.981	2.089	2.197	2.305	2.412	2.520	2.628	2.736
0.4	1.600	1.718	1.835	1.953	2.070	2.188	2.306	2.423	2.541	2.658	2.776	2.894
0.35	1.650	1.777	1.905	2.032	2.160	2.287	2.414	2.542	2.669	2.797	2.924	3.051
0.3	1.700	1.837	1.974	2.112	2.249	2.386	2.523	2.660	2.798	2.935	3.072	3.209
0.25	1.750	1.897	2.044	2.191	2.338	2.485	2.632	2.779	2.926	3.073	3.220	3.367
0.2	1.800	1.957	2.114	2.270	2.427	2.584	2.741	2.898	3.054	3.211	3.368	3.525
0.15	1.850	2.017	2.183	2.350	2.516	2.683	2.850	3.016	3.183	3.349	3.516	3.683
0.1	1.900	2.076	2.253	2.429	2.606	2.782	2.958	3.135	3.311	3.488	3.664	3.840
0.05	1.950	2.136	2.322	2.509	2.695	2.881	3.067	3.253	3.440	3.626	3.812	3.998
0	2.000	2.196	2.392	2.588	2.784	2.980	3.176	3.372	3.568	3.764	3.960	4.156
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Table 7 - Maximum Nominal Catch As A Percent of ACE Such That Actual Catch < ACE With a Probability of 97.5 pct; bias multiplier of 2

	CV											
Nominal Discards as Pct of Catch	0	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.55
0	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
0.05	0.952	0.944	0.935	0.926	0.918	0.910	0.902	0.894	0.886	0.879	0.871	0.864
0.1	0.909	0.893	0.878	0.863	0.849	0.835	0.821	0.808	0.796	0.783	0.772	0.760
0.15	0.870	0.848	0.827	0.808	0.789	0.771	0.754	0.738	0.722	0.707	0.693	0.679
0.2	0.833	0.807	0.782	0.759	0.737	0.716	0.697	0.678	0.661	0.644	0.628	0.613
0.25	0.800	0.770	0.742	0.716	0.692	0.669	0.648	0.628	0.609	0.591	0.575	0.559
0.3	0.769	0.736	0.705	0.677	0.651	0.627	0.605	0.584	0.565	0.547	0.530	0.514
0.35	0.741	0.705	0.672	0.643	0.616	0.591	0.568	0.546	0.527	0.508	0.491	0.475
0.4	0.714	0.676	0.642	0.612	0.584	0.558	0.535	0.513	0.493	0.475	0.458	0.442
0.45	0.690	0.650	0.615	0.583	0.555	0.529	0.505	0.484	0.464	0.446	0.429	0.413
0.5	0.667	0.626	0.590	0.557	0.529	0.503	0.479	0.457	0.438	0.420	0.403	0.388
0.55	0.645	0.603	0.566	0.534	0.505	0.479	0.455	0.434	0.415	0.397	0.381	0.366
0.6	0.625	0.582	0.545	0.512	0.483	0.457	0.434	0.413	0.394	0.376	0.360	0.346
0.65	0.606	0.563	0.525	0.492	0.463	0.437	0.414	0.393	0.375	0.358	0.342	0.328
0.7	0.588	0.544	0.506	0.474	0.445	0.419	0.396	0.376	0.357	0.341	0.326	0.312
0.75	0.571	0.527	0.489	0.456	0.428	0.402	0.380	0.360	0.342	0.325	0.311	0.297
0.8	0.556	0.511	0.473	0.440	0.412	0.387	0.365	0.345	0.327	0.311	0.297	0.284
0.85	0.541	0.496	0.458	0.426	0.397	0.373	0.351	0.332	0.314	0.299	0.284	0.272
0.9	0.526	0.482	0.444	0.412	0.384	0.359	0.338	0.319	0.302	0.287	0.273	0.260
0.95	0.513	0.468	0.431	0.399	0.371	0.347	0.326	0.307	0.291	0.276	0.262	0.250
1	0.500	0.455	0.418	0.386	0.359	0.336	0.315	0.297	0.280	0.266	0.253	0.241

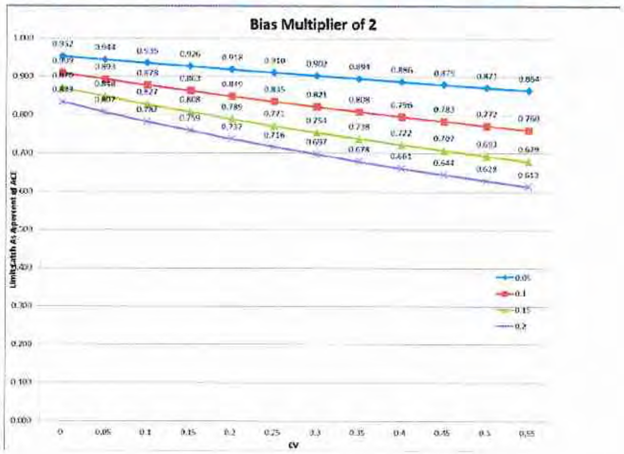
Enclosure (3)
Groundfish PDT report dated July 27, 2012

Figure 1 – Effects of discard bias on maximum catch (as a percent of ACE) such that there is a high probability that true catch does not exceed allocated ACE. Nominal discards are assumed to be 10 percent of nominal catch. Lines indicate the maximum percent of ACE that can be caught (nominal landings plus discards) with a high probability that the allocated ACE is not exceeded.



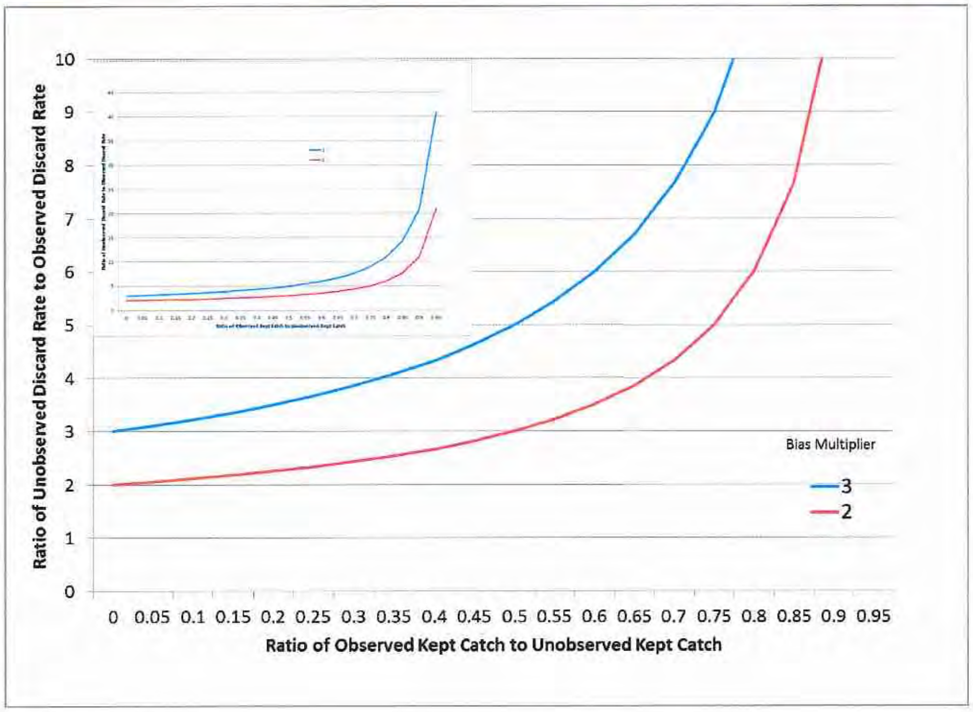
Enclosure (3)
Groundfish PDT report dated July 27, 2012

Figure 2 - Effects of discard bias on maximum catch (as a percent of ACE) such that there is a high probability that true catch does not exceed allocated ACE. Bias multiplier of 2, nominal discards are assumed to be a percent of nominal catch as shown. Lines indicate the maximum percent of ACE that can be caught (nominal landings plus discards) with a high probability that the allocated ACE is not exceeded.



Enclosure (3)
Groundfish PDT report dated July 27, 2012

Figure 3 – Relative difference between discard ratio on observed and unobserved trips at different levels of observed kept catch.



May 25, 2012
Enclosure (5) to Groundfish PDT report dated July 27, 2012

Enclosure (5)
Full Retention

Regulatory Restrictions

There are two primary ways that regulations can prevent full retention of fish that are caught: through the use of size limits (which can include minimum size limits or slot limits that restrict landing to a range of sizes) and through the use of possession limits.

The Northeast Multispecies FMP specifies minimum size limits for cod, haddock, yellowtail flounder, winter flounder, witch flounder, plaice, redfish, pollock, and halibut. Minimum size limits are not specified for white hake, wolffish, ocean pout, or windowpane flounder (three of these species cannot be landed under present regulations). Common pool vessels are subject to possession limits for several stocks. The FMP can modify these minimum size limits and possession limits through a framework adjustment or an amendment. The Northeast Multispecies FMP cannot require full retention of species managed in other FMPs (monkfish, skates, dogfish, etc.).

When minimum size limits were adopted in the original FMP (1986), it was the principal management measure in the management program. It was intended to direct the fishery away from immature fish and focus the catch on fish that have already contributed to the spawning potential of the stocks (NEFMC 1985). The appropriate minimum size was established based on the average length of fish at sexual maturity "and other factors which may include commercial considerations." These other factors included the mixed nature of the fishery, the mortality of sub-legal fish caught in the net and impacts on discards. Minimum sizes adopted included 17 inches for cod, haddock, and pollock, 14 inches for witch flounder, 12 inches for yellowtail flounder and plaice, and 11 inches for winter flounder. Minimum sizes for cod, haddock, pollock, witch flounder, and winter flounder were scheduled to increase in year 2 of the plan. This schedule was later modified. The link between minimum fish size and mesh selectivity was recognized, and planned increases in the minimum mesh size were included. These mesh size increases were later delayed.

Amendment 5, in addition to adopting a permit moratorium and effort controls, made a subtle change in the use of minimum mesh sizes and minimum fish sizes. Vessels retaining more than 500 pounds of groundfish were required to fish under an appropriate mesh regulation for the area fished. The minimum fish sizes for regulated species were supposed to be set at the length where 25 percent of the fish at minimum size would be retained, with the exception of winter flounder.

Over time, the mesh regulations were modified without corresponding changes to the minimum size requirements. While the regulations still include a provision that minimum sizes should be set at the length at which 25 percent of the regulated species would be retained, this has not been used to adjust minimum sizes since Amendment 7. For example, in Amendment 13 (2004) mesh changes were used to avoid additional DAS reductions and minimum sizes were not increased at the same time.

Possession limits no longer apply to sector vessels for allocated groundfish[1], but they are still used for common pool vessels fishing under effort controls. While this measure may not be needed as a mortality control since the common pool is now subject to quotas, it does serve to slow the catch of these stocks and provides extended opportunities for common pool fishermen.

Biological Considerations

The combination of minimum size and mesh increases has affected the size of fish captured. The selectivity of several multispecies stocks has shifted to older fish as these regulations changed over time, generally consistent with the adoption of increased mesh sizes and minimum sizes (see, for example, stock assessments for GB cod, GOM cod, GB haddock, GOM haddock, and plaice). In at least one assessment (GOM cod) the shift in selectivity is partially credited with helping the stock sustain high fishing mortality rates over time. These shifts in selectivity have changed (increased) the yield-per-recruit values and biological reference points (such as F40).

Halliday and Pinhorn (2002) reviewed the scientific and technical basis for policies on the capture of small fish in North Atlantic groundfish fisheries. They note that these regulations are usually justified as a way to increase yields or to improve recruitment. An objective of increasing recruitment requires an assumption that there is a direct relationship between SSB and recruitment. This report is ambivalent about the utility of such regulations, noting that many of the presumed benefits may not be realized. This report, however, does not explicitly address the changes in yield per recruit realized with NE groundfish over time.

The impacts of removing minimum size regulations are difficult to predict because of the interactions with minimum mesh regulations and other factors that affect selectivity (time and area fished, targeting behavior, etc.). Mesh characteristics are only one factor that determines the selectivity of the fishery but are believed to be important for trawls and gillnets. While it is sometimes argued that requiring full retention will merely convert discards to landings and not affect the catch at age, this assumption may not prove valid if profits can be increased by targeting smaller fish. This is explored further in a following section. If removing minimum fish sizes leads to a change in fishing behavior such that smaller fish are increasingly selected by the fishery, then there will be changes in the yield per recruit (YPR) and biological reference points (including Fmsy and SSB_{MSY} or their proxies). These changes were explored by the PDT to determine the likely magnitude of the changes and their impacts on potential yields.

Table 1 summarizes the changes in YPR for four stocks that are used as examples: witch flounder, GB haddock, CC/GOM yellowtail flounder, and GOM cod. Using the selectivity as determined by the 2012 groundfish updates or SARC 53 as a starting point,

[1] Ocean pout, windowpane flounder, Atlantic wolffish, and SNE/MA winter flounder are not allocated and retention is prohibited.

changes at age were examined in quarter-year increments for their impact on YPR. As can be seen from the tables, a shift in selectivity of one year reduces the YPR for these stocks between 9.4 pct (GOM cod) to 4.6 pct (GB haddock). The value of F40 for these stocks declines from 18.5 pct (GOM cod) to 30 pct (GB haddock, witch flounder). Over the long term, these changes would lead to reduced catches at a given stock size and a reduced value for MSY.

While this analysis focuses on changes in YPR, it does not address possible changes in recruitment. For some groundfish stocks there is evidence that older, larger fish have higher fecundity. Older, larger fish tend to produce more eggs, and more of the eggs survive to the larval stage. In some cases the differences are dramatic. For example, the number of yellowtail flounder eggs that are produced increases rapidly as size increases. YPR analyses do not address the changes in recruitment that may occur from reducing the number of older fish in the population.

Whether requiring full retention of allocated stocks would result in a shift in selectivity to younger ages will not be known until a few years after the regulatory change when an assessment is conducted. In the interim, ABCs/ACLs would normally be set based on the observed selectivity. Another consideration is the effect that a change in selectivity would have if catch quotas are based on a different selectivity pattern. The impacts are not necessarily easy to predict and are not obvious, because the selectivity pattern interacts with the age structure of the population, rebuilding requirements, and the changes in the fishing mortality reference point. As an example, the implications are explored for two representative stocks: GOM cod and CC/GOM yellowtail flounder. Note that these examples assume that there is no change in recruitment as a result of fishing on younger fish.

GOM Cod

For this analysis, a stock projection based on the SARC 53 assessment was performed. An estimated catch for 2011 and 2012 was used as an input, and then the catch at 75 pct of F_{MSY} is used for years 2014 through 2030. The catches, realized fishing mortality (F/F_{MSY}), SSB/SSB_{MSY} ratio, probability of overfishing, and probability of rebuilding are shown in the Table 2. This is considered the baseline projection.

A comparison to the baseline projection used a selectivity pattern shifted one year to younger ages. No adjustment was made to the selectivity at ages beyond the age of full recruitment. The same data elements are reported in Table 3. For the comparison to be valid, a new SSB_{MSY} was calculated using the F40 proxy that applies to the revised selectivity pattern. This projection used the same catches as were used in the baseline projection.

Comparing the two projections reveals that if the same catches are used in both projections (as would be the case if the ABCs were set for the entire time period based on the SARC 53 selectivity) and selectivity shifts to younger fish, the ratio of F/FMSY under the new selectivity is higher than in the baseline projection. Rebuilding would be slower (delayed about two years beyond the baseline projection) and the probability of overfishing is higher. The baseline and revised selectivity ratios of SSB/SSBMSY are plotted in Figure 2.

A more realistic scenario is shown in Table 4. This example assumes that the new selectivity is detected and ABCs for 2015 and beyond are set using this new pattern while fishing at 75 pct of FMSY. Catches would be lower and rebuilding occurs about one year later than the baseline projection.

CC/GOM yellowtail flounder

For this analysis, a stock projection based on the SARC 53 assessment was performed. An estimated catch for 2011 and 2012 was used as an input, and then the catch at 75 pct of F_{MSY} is used for years 2014 through 2023. The catches, realized fishing mortality (F/F_{MSY}), SSB/SSB_{MSY} ratio, probability of overfishing, and probability of rebuilding are shown in the Table 5. This is considered the baseline projection.

A comparison to the baseline projection used a selectivity pattern shifted one year to younger ages. No adjustment was made to the selectivity at ages beyond the age of full recruitment. The same data elements are reported in Table 6. For the comparison to be valid, a new SSB_{MSY} was calculated using the F40 proxy that applies to the revised selectivity pattern. This projection used the same catches as were used in the baseline projection.

Comparing the two projections reveals that if the same catches are used in both projections (as would be the case if the ABCs were set for the entire time period based on the SARC 53 selectivity) and selectivity shifts to younger fish, the ratio of F/FMSY under the new selectivity is higher than in the baseline projection. Rebuilding time would be almost the same and the probability of overfishing is higher.

A more realistic scenario is shown in Table 7. This example assumes that the new selectivity is detected and ABCs for 2015 and beyond are set using this new pattern while fishing at 75 pct of FMSY. Catches would be about ten percent lower in each year of the rebuilding period.

Conclusions

For the two examples shown, a change in selectivity to younger ages would result in a reduction in yields over the long term. It does not appear that there would be an increase in fishing mortality in the short term that would be caused by fishing on a quota that was set with a different selectivity.

May 25, 2012
Enclosure (5) to Groundfish PDT report dated July 27, 2012

Evaluating the Likelihood of a Selectivity Change

While it is sometimes argued that removing minimum size regulations will just convert discards to landings, it is possible that the selectivity pattern may change for some or all species. This would depend, in part, on whether fishermen can increase profits by targeting smaller fish. Whether this will occur depends on several factors, including whether there is a price differential for a species that is based on size, whether it is easy to target smaller fish, and the relative abundance of different size fish. If fishermen can catch smaller fish more quickly and thus reduce operating costs then a change in selectivity is more likely.

The potential for changes in selectivity can be inferred from the fact that for some stocks, fishermen targeted smaller fish in the recent past. For example, the minimum sizes in the late 1980's were smaller than they are now for most groundfish stocks. This is not conclusive, however, since the regulatory system was very different. The fishery was open access and there no limits on effort or landings.

Price differential: If the price difference between large and small fish is large, then targeting small fish will only be profitable if the increased catch rates reduce operating costs sufficiently to outweigh the premium for larger fish. If the difference is small or non-existent it is more likely that small fish will be targeted since generally they are more abundant. 2011 dealer prices were examined for seven groundfish species. Prices are only available for fish that presumably met minimum size requirements; it is unknown if these prices reflect the price that may be received for fish smaller than the current minimum sizes.

Each documented sale to a dealer was treated as a price observation, and box plots were created for each species by reported market category (Figure 2). Cod, haddock, plaice, witch flounder, white hake, and redfish generally show increasing price per pound as size increases. There are some exceptions, however – for example, market and scrod haddock had similar prices in 2011, whale cod prices were generally lower than large cod, and redfish prices were similar for all market sizes except large. Yellowtail flounder prices were generally similar for all market categories. Winter flounder prices were similar at all categories with the exception of lemon sole. Halibut prices were similar for all market categories.

Ease of targeting: The ability to target smaller fish depends on a number of factors – relative abundance, spatial and temporal distribution of different sizes, and whether fishing practices need to be revised. Otter trawls can potentially change the number of small fish they catch simply by changing from diamond to square mesh. While there are numerous factors that affect selectivity, including time and area fished; this is one that is easily observed. Observed trawl trips (NEGEAR =050) for 2010 and 2011 (NEFOP) were queried to determine the length-frequency of species catch with diamond and square mesh codend (mesh size 5.5 inches or greater). As can be seen in the accompanying plots (Figure 3), changing the type of mesh towed can change the size of fish caught for cod, pollock, yellowtail flounder, and winter flounder. It appears to do little to affect the size of haddock, witch flounder and plaice that are caught.

Based on these analyses, it would appear more probable that eliminating the minimum size could lead to a change in selectivity for yellowtail flounder and winter flounder than for other stocks. There is little price differential between the current sizes landed and simply changing the type of cod-end used can modify the size of fish caught. A change may be less likely to occur for cod because of the price differential between large and small fish.

Gear In Use

The previous paragraph summarized differences in selectivity between diamond and square mesh, and showed that for some species diamond mesh selects for smaller fish. Whether a change in mesh would lead to a shift in fishery selectivity depends what mesh is currently used. As shown in Figure 4, observed trawl tows (NEGEAR=050) retaining groundfish use diamond mesh more often than square mesh. In the GOM and GB there appears to have been a shift to more frequent use of diamond mesh on observed tows since 2006. Assuming that the mesh used on observed tows reflects that used on unobserved tows, roughly 30 percent of tows could be shifted to diamond mesh.

Conclusion

There is a potential that removing minimum size limits will result in increased targeting of smaller fish for some groundfish species. Relatively minor changes in behavior – such as using a particular mesh configuration – can lead to this result.

Discussion

While there does appear to be the potential that requiring full retention by removing minimum size and possession limits may result in a change of fishery selectivity, as long as catches are adequately monitored and the change can be detected in reasonable amount of time it should not lead to biological concerns for most groundfish stocks. If there is a shift, the long term impacts are that fishery yields will decline, F_{MSY} or its proxy will likely decline, and SSB_{MSY} or its proxy will probably increase. Rebuilding periods may be extended if adjustments are not made to projected catches to account for the change in selectivity. These changes should be anticipated and planned for.

May 25, 2012
Enclosure (5) to Groundfish PDT report dated July 27, 2012

Table 1 – Impact of changes in selectivity on YPR for four groundfish stocks

GB haddock

age	status quo	"1/4	"1/2	"3/4	"1 age
1	0.018048	0.03	0.04	0.045	0.059397
2	0.059397	0.09	0.13	0.18	0.222259
3	0.222259	0.25	0.29	0.33	0.384552
4	0.384552	0.44	0.53	0.61	0.707236
5	0.707236	0.84	0.93	0.99	1
6	1	1	1	1	1
7	1	1	1	1	1
8	1	1	1	1	1
9	1	1	1	1	1
F40	0.3872	0.3492	0.3153	0.2903	0.2692
ypr	0.49168	0.486	0.48	0.47483	0.46917
ratio	1	0.988448	0.976245	0.96573	0.954218

witch fld

age	status quo	"1/4	"1/2	"3/4	"1 age
3	0.011	0.02	0.022	0.03	0.039
4	0.039	0.05	0.055	0.069	0.091
5	0.091	0.15	0.22	0.31	0.42
6	0.427	0.59	0.78	0.93	1
7	1	1	1	1	1
8	1	1	1	1	1
9	1	1	1	1	1
10	1	1	1	1	1
11	1	1	1	1	1
F40	0.2718	0.2287	0.213	0.1995	0.1896
ypr	0.20682	0.20118	0.19795	0.19471	0.19194
ratio	1	0.97273	0.957112	0.941447	0.928053

May 25, 2012
Enclosure (5) to Groundfish PDT report dated July 27, 2012

CC gom YT

age	status quo	"1/4	"1/2	"3/4	"1 age
1	0.001	0.015	0.03	0.062	0.064
2	0.064	0.14	0.26	0.39	0.486
3	0.486	0.64	0.79	0.92	1
4	1	1	1	1	1
5	1	1	1	1	1
6	1	1	1	1	1
F40	0.2594	0.2382	0.2178	0.2007	0.1917
ypr	0.21265	0.20811	0.20342	0.19883	0.19674
ratio to sq	1	0.97865	0.956595	0.935011	0.925182

GOM cod

age	status quo	"1/4	"1/2	"3/4	"1 age
1	0.02	0.036	0.05	0.072	0.109
2	0.109	0.17	0.22	0.31	0.395
3	0.395	0.5	0.63	0.75	0.844
4	0.844	0.92	0.95	0.98	1
5	1	1	1	1	1
6	1	1	1	1	1
7	0.896	0.896	0.896	0.896	0.896
8	0.88	0.88	0.88	0.88	0.88
9	0.673	0.673	0.673	0.673	0.673
F40	0.1962	0.1852	0.1765	0.1674	0.1599
ypr	1.20128	1.17111	1.14553	1.11565	1.0884
ratio sq	1	0.974885	0.953591	0.928718	0.906034

Table 2 – GOM cod projection using SARC 53 inputs

		FMSY:	0.2	SSBMSY:	61218		
Year	Catch	F	F/FMSY	SSB	SSB/SSBMSY	Prob Over	Prob.Rebuilt
2011	7750	0.92	4.60	9478	0.15	1.000	0.000
2012	6700	0.879	4.40	8168	0.13	0.995	0.000
2013	1961	0.2	1.00	10235	0.17	0.500	0.000
2014	2463	0.15	0.75	16376	0.27	0.220	0.000
2015	3525	0.1496	0.75	23379	0.38	0.220	0.000
2016	4484	0.1495	0.75	30195	0.49	0.232	0.010
2017	5387	0.1491	0.75	36947	0.60	0.224	0.046
2018	6298	0.1499	0.75	43815	0.72	0.220	0.128
2019	7061	0.1499	0.75	50941	0.83	0.220	0.279
2020	7683	0.1502	0.75	57045	0.93	0.220	0.414
2021	8128	0.1496	0.75	61641	1.01	0.223	***0.508***
2022	8499	0.15	0.75	65248	1.07	0.219	0.567
2023	8762	0.1493	0.75	68080	1.11	0.217	0.616
2024	8938	0.1491	0.75	70324	1.15	0.214	0.651
2025	9105	0.1496	0.75	71952	1.18	0.215	0.674
2026	9193	0.1496	0.75	72896	1.19	0.213	0.686
2027	9281	0.15	0.75	73558	1.20	0.215	0.697
2028	9338	0.1492	0.75	74564	1.22	0.212	0.707
2029	9395	0.1489	0.74	74960	1.22	0.213	0.715
2030	9455	0.1498	0.75	75507	1.23	0.211	0.719
Total	143406						

Table 3 - GOM cod projection using SARC 53 inputs but revised selectivity in 2013 and beyond

		FMSY:	0.1599	SSBMSY:	62900		
Year	Catch	F	F/FMSY	SSB	SSB/SSBMSY	Prob Over	Prob.Rebuilt
2011	7750	0.92	*4.60*	*9478*	*0.15*	1.00	0.00
2012	6700	0.8787	*4.40*	*8168*	*0.13*	0.99	0.00
2013	1961	0.1293	0.81	10281	0.16	0.27	0.00
2014	2463	0.1082	0.68	16445	0.26	0.14	0.00
2015	3525	0.1175	0.73	23388	0.37	0.20	0.00
2016	4484	0.1236	0.77	30117	0.48	0.24	0.01
2017	5387	0.1266	0.79	36932	0.59	0.26	0.04
2018	6298	0.1309	0.82	43633	0.69	0.28	0.11
2019	7061	0.1342	0.84	50510	0.80	0.30	0.23
2020	7683	0.1369	0.86	55892	0.89	0.32	0.36
2021	8128	0.1385	0.87	59777	0.95	0.34	0.44
2022	8499	0.1408	0.88	62552	0.99	0.35	0.49
2023	8762	0.1425	0.89	64613	1.03	0.37	***0.53***
2024	8938	0.1441	0.90	65906	1.05	0.38	0.55
2025	9105	0.1459	0.91	66657	1.06	0.39	0.56
2026	9193	0.1474	0.92	66906	1.06	0.40	0.57
2027	9281	0.1485	0.93	67073	1.07	0.42	0.57
2028	9338	0.1499	0.94	66753	1.06	0.42	0.57
2029	9395	0.1509	0.94	66657	1.06	0.44	0.56
2030	9455	0.1526	0.95	66589	1.06	0.45	0.56

Figure 1 – GOM cod SSB/SSBMSY under two selectivity scenarios

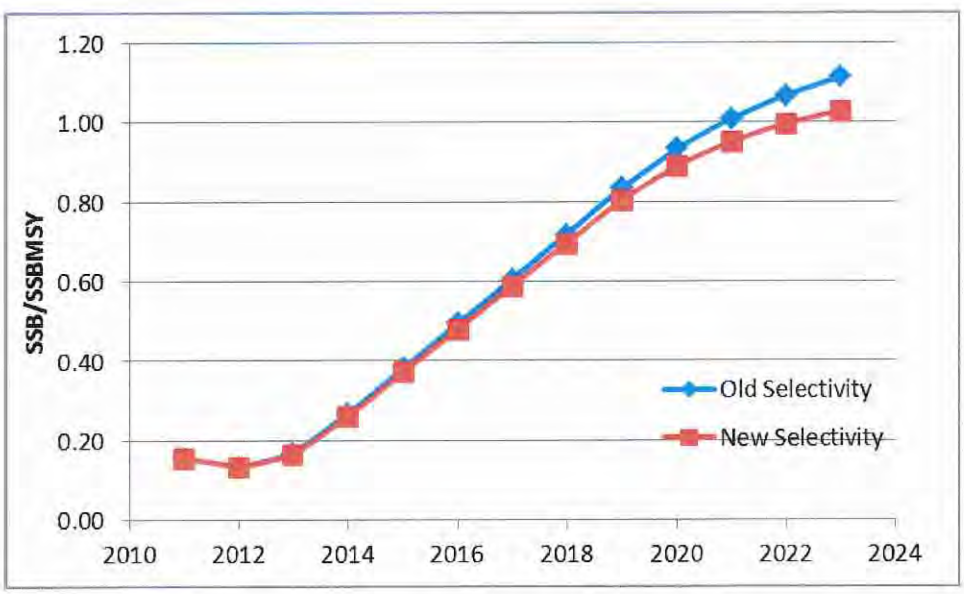


Table 4 – GOM cod projection with revised selectivity and new catches based on 75 pct of FMSY beginning in 2015

75% FMSY after 2015		FMSY:	0.1599	SSBMSY:	62900		
Year	Catch	F	F/FMSY	SSB	SSB/SSBMSY	Prob Over	Prob.Rebuilt
2011	7750	0.92	*4.60*	*9478*	*0.15*	1.00	0.00
2012	6700	0.8787	*4.40*	*8168*	*0.13*	0.99	0.00
2013	1961	0.1293	0.81	10281	0.16	0.27	0.00
2014	2463	0.1082	0.68	16445	0.26	0.14	0.00
2015	3594	0.1199	0.75	23375	0.37	0.21	0.00
2016	4349	0.1199	0.75	30080	0.48	0.22	0.01
2017	5117	0.1198	0.75	37034	0.59	0.22	0.04
2018	5820	0.1196	0.75	44062	0.70	0.21	0.11
2019	6438	0.1198	0.75	51484	0.82	0.21	0.25
2020	6928	0.1196	0.75	57585	0.92	0.21	0.39
2021	7322	0.1197	0.75	62356	0.99	0.21	0.49
2022	7610	0.1195	0.75	66086	1.05	0.20	***0.56***
2023	7839	0.1196	0.75	69120	1.10	0.20	0.61
2024	8011	0.1198	0.75	71412	1.14	0.20	0.64
2025	8144	0.12	0.75	73113	1.16	0.19	0.66
2026	8220	0.1199	0.75	74154	1.18	0.19	0.68
2027	8297	0.1199	0.75	75135	1.19	0.19	0.70
2028	8355	0.12	0.75	75672	1.20	0.19	0.71
2029	8390	0.1197	0.75	76154	1.21	0.19	0.71
2030	8443	0.1199	0.75	76664	1.22	0.19	0.72

Table 5 – CC/GOM yellowtail flounder projection using SARC 53 inputs

		FMSY:	0.26	SSBMSY:	7.080		
Year	Catch	F	F/FMSY	SSB	SSB/SSBMSY	Prob Over	Prob.Rebuilt
2011	747	0.3353	1.29	2.8442	0.402	0.95	0
2012	950	0.3718	1.43	2.9221	0.413	0.974	0
2013	549	0.1952	0.75	3.4581	0.488	0.0733	0
2014	719	0.1947	0.75	4.528	0.640	0.0592	0.0244
2015	888	0.1943	0.75	5.4332	0.767	0.0788	0.1134
2016	1048	0.1945	0.75	6.2754	0.886	0.0921	0.2881
2017	1177	0.1944	0.75	6.9591	0.983	0.1103	0.4704
2018	1267	0.1943	0.75	7.4591	1.054	0.1207	0.5901
2019	1331	0.1933	0.74	7.8211	1.105	0.1276	0.6612
2020	1370	0.1925	0.74	8.0686	1.140	0.1264	0.7
2021	1399	0.1924	0.74	8.2303	1.162	0.1322	0.7253
2022	1416	0.1918	0.74	8.3539	1.180	0.1339	0.7422
2023	1430	0.1913	0.74	8.4361	1.192	0.1355	0.7453

May 25, 2012
Enclosure (5) to Groundfish PDT report dated July 27, 2012

Table 6 – CC/GOM yellowtail flounder projection using SARC 53 inputs but revised selectivity in 2013 and beyond

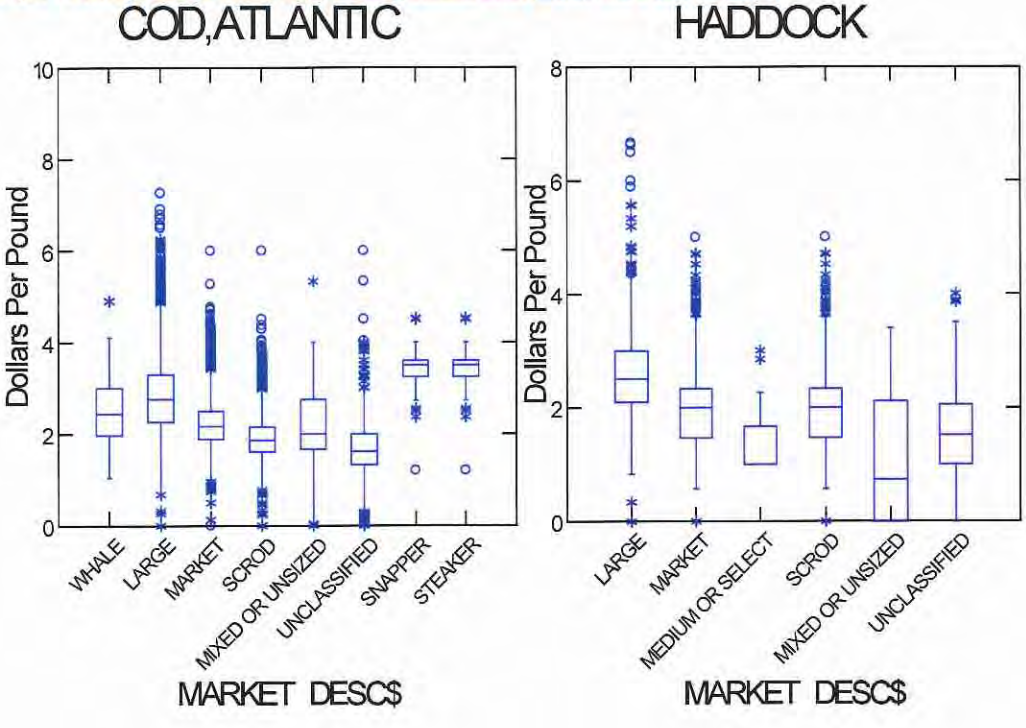
		FMSY:	0.1917	SSBMSY:	7.120		
Year	Catch	F	F/FMSY	SSB	SSB/SSBMSY	Prob Over	Prob.Rebuilt
2011	747	0.3353	1.29	2.8442	0.402	0.95	0
2012	950	0.3718	1.43	2.9221	0.413	0.974	0
2013	549	0.1321	0.69	3.4914	0.490	0.0087	0
2014	719	0.1361	0.71	4.5615	0.641	0.0265	0.0235
2015	888	0.145	0.76	5.416	0.761	0.0674	0.1071
2016	1048	0.1518	0.79	6.1989	0.871	0.1212	0.2574
2017	1177	0.1567	0.82	6.8155	0.957	0.1788	0.4245
2018	1267	0.1604	0.84	7.2275	1.015	0.2177	0.5249
2019	1331	0.1645	0.86	7.4763	1.050	0.2462	0.5784
2020	1370	0.1649	0.86	7.6459	1.074	0.2669	0.6057
2021	1399	0.1669	0.87	7.7218	1.085	0.2859	0.6206
2022	1416	0.168	0.88	7.7745	1.092	0.2982	0.6297
2023	1430	0.1685	0.88	7.8132	1.097	0.3126	0.6349

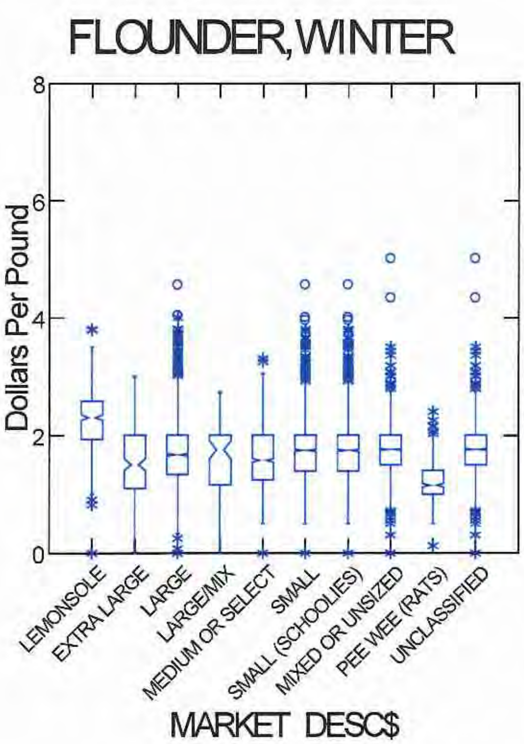
Table 7 – CC/GOM yellowtail flounder projection with revised selectivity and new catches based on 75 pct of FMSY beginning in 2015

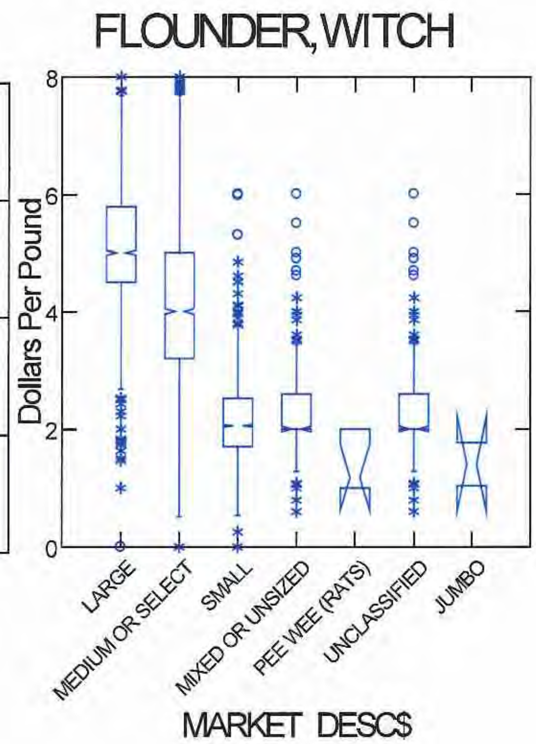
75% FMSY after 2015		FMSY:	0.1917	SSBMSY:	7.120		
Year	Catch	F	F/FMSY	SSB	SSB/SSBMSY	Prob Over	Prob.Rebuilt
2011	747	0.3353	1.29	2.8442	0.402	0.95	0
2012	950	0.3718	1.43	2.9221	0.413	0.974	0
2013	549	0.1321	0.69	3.4914	0.490	0.0087	0
2014	719	0.1361	0.71	4.5615	0.641	0.0265	0.0235
2015	850	0.1384	0.72	5.4306	0.763	0.0395	0.1084
2016	964	0.1381	0.72	6.2687	0.880	0.0474	0.2718
2017	1063	0.1383	0.72	6.9812	0.981	0.0595	0.4645
2018	1138	0.139	0.73	7.504	1.054	0.069	0.5909
2019	1190	0.1392	0.73	7.8687	1.105	0.0782	0.6671
2020	1225	0.1388	0.72	8.1544	1.145	0.0807	0.7139
2021	1251	0.1389	0.72	8.332	1.170	0.084	0.7454
2022	1270	0.139	0.73	8.4706	1.190	0.0871	0.7636
2023	1284	0.1386	0.72	8.5896	1.206	0.087	0.7793

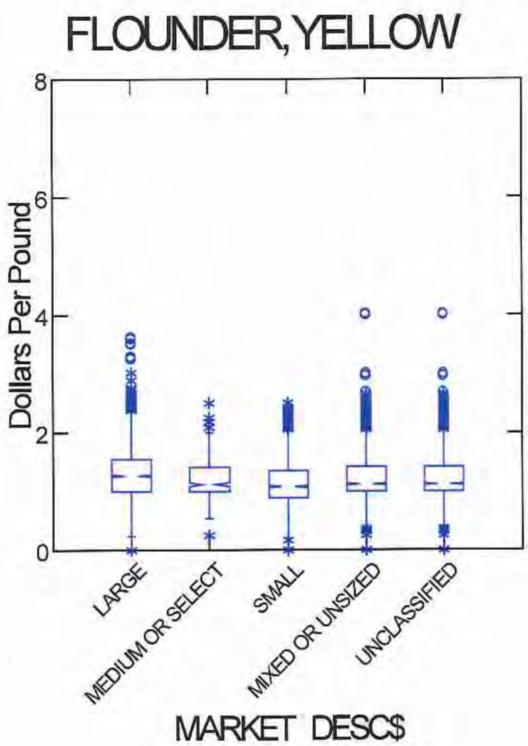
May 25, 2012
Enclosure (5) to Groundfish PDT report dated July 27, 2012

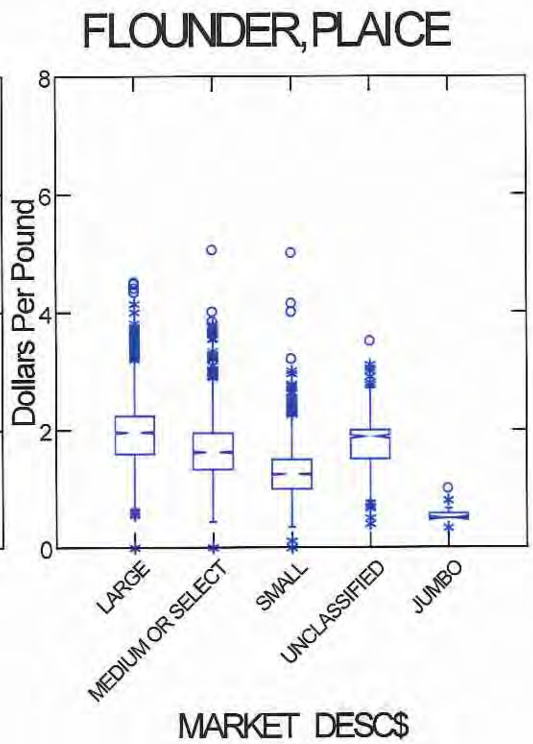
Figure 2 – Average price by market category for key groundfish stocks (Source: NMFS dealer data, 2011)



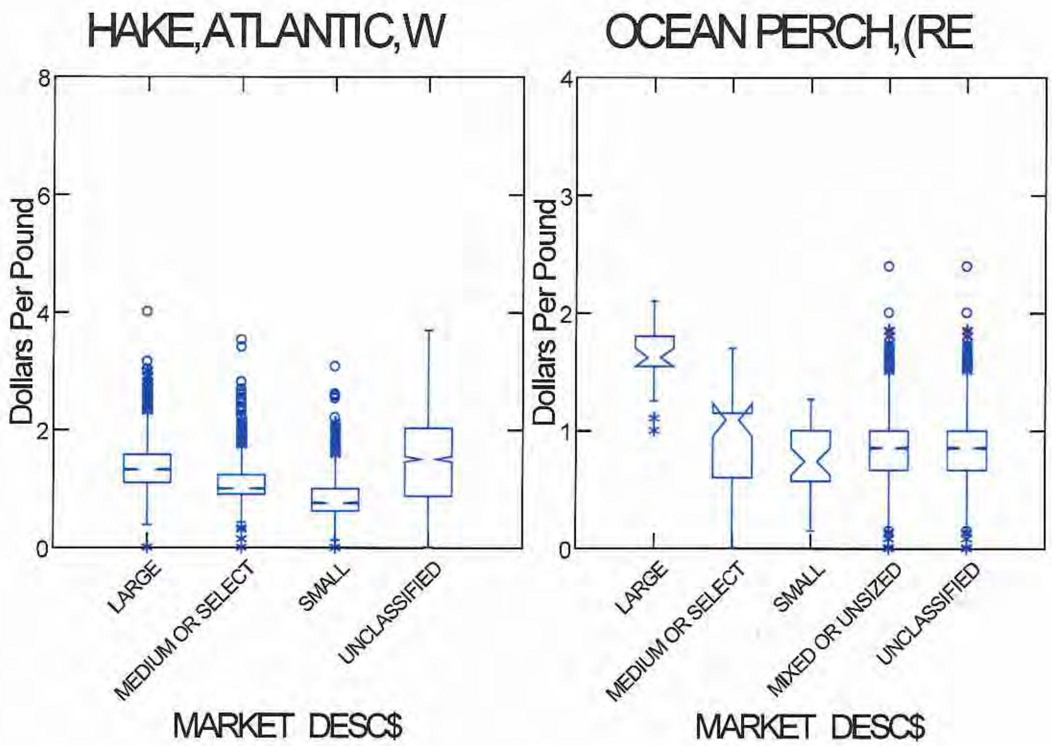

FLOUNDER, WINTER
8
6
4
2
0
Dollars Per Pound
LEMONSOLE
EXTRA LARGE
LARGE
LARGE/MIX
MEDIUM OR SELECT
SMALL
SMALL (SCHOOLIES)
MIXED OR UNSIZED
PEE WEE (RATS)
UNCLASSIFIED
MARKET DESC$


FLOUNDER, WITCH
8
6
4
2
0
Dollars Per Pound
LARGE
MEDIUM OR SELECT
SMALL
MIXED OR UNSIZED
PEE WEE (RATS)
UNCLASSIFIED
JUMBO
MARKET DESC$


FLOUNDER, YELLOW
Dollars Per Pound
0
2
4
6
8
LARGE
MEDIUM OR SELECT
SMALL
MIXED OR UNSIZED
UNCLASSIFIED
MARKET DESC$


FLOUNDER, PLAICE
Dollars Per Pound
0
2
4
6
8
LARGE
MEDIUM OR SELECT
SMALL
UNCLASSIFIED
JUMBO
MARKET DESC$

May 25, 2012
Enclosure (5) to Groundfish PDT report dated July 27, 2012



May 25, 2012
Enclosure (5) to Groundfish PDT report dated July 27, 2012

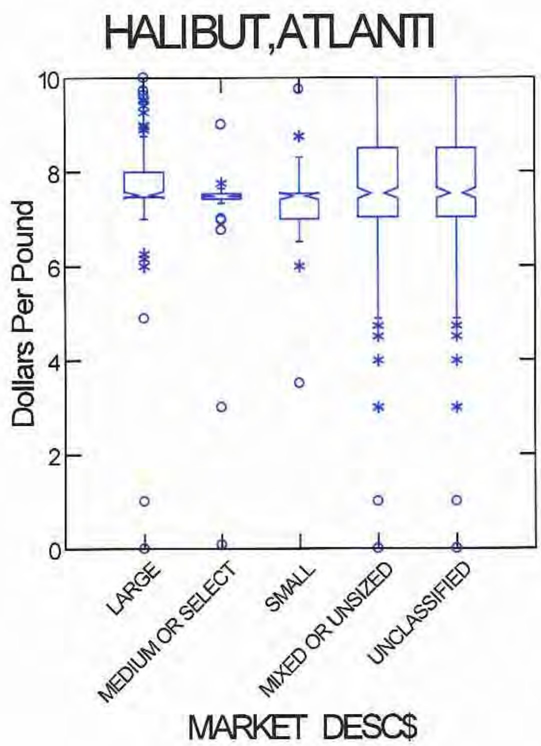
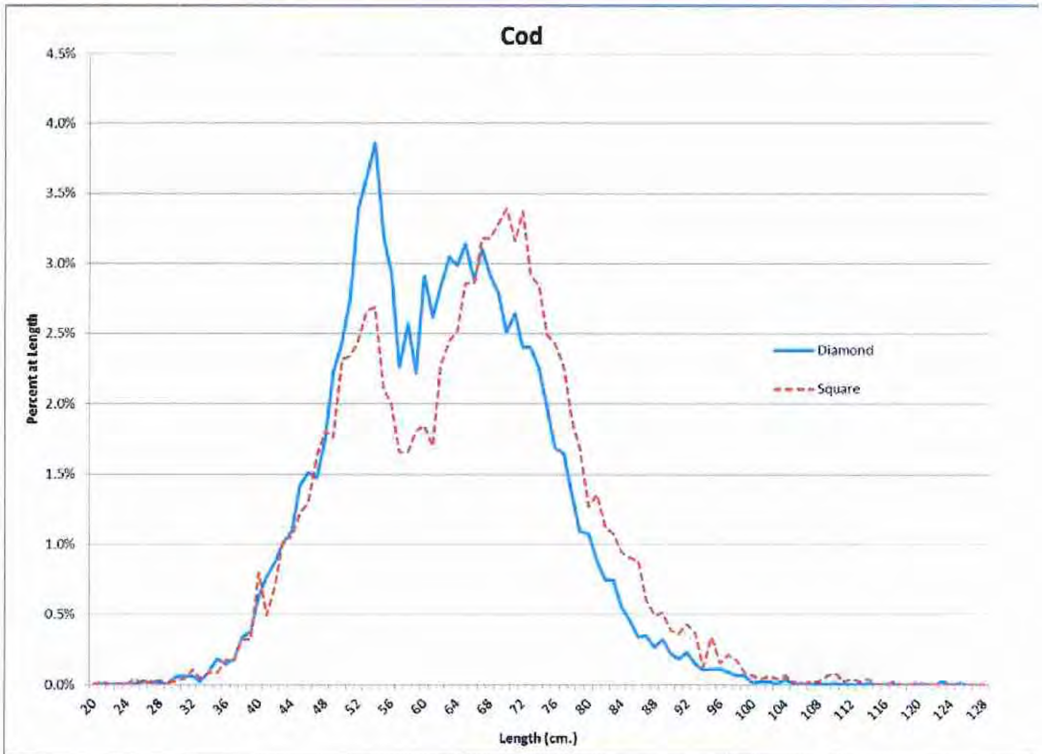
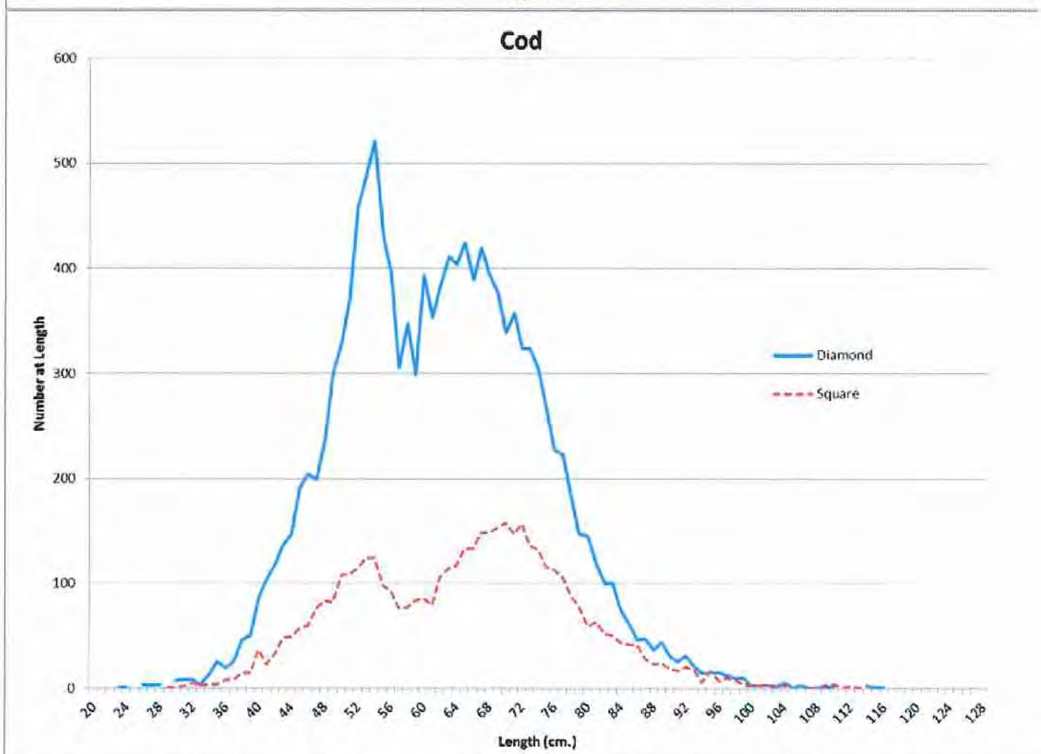
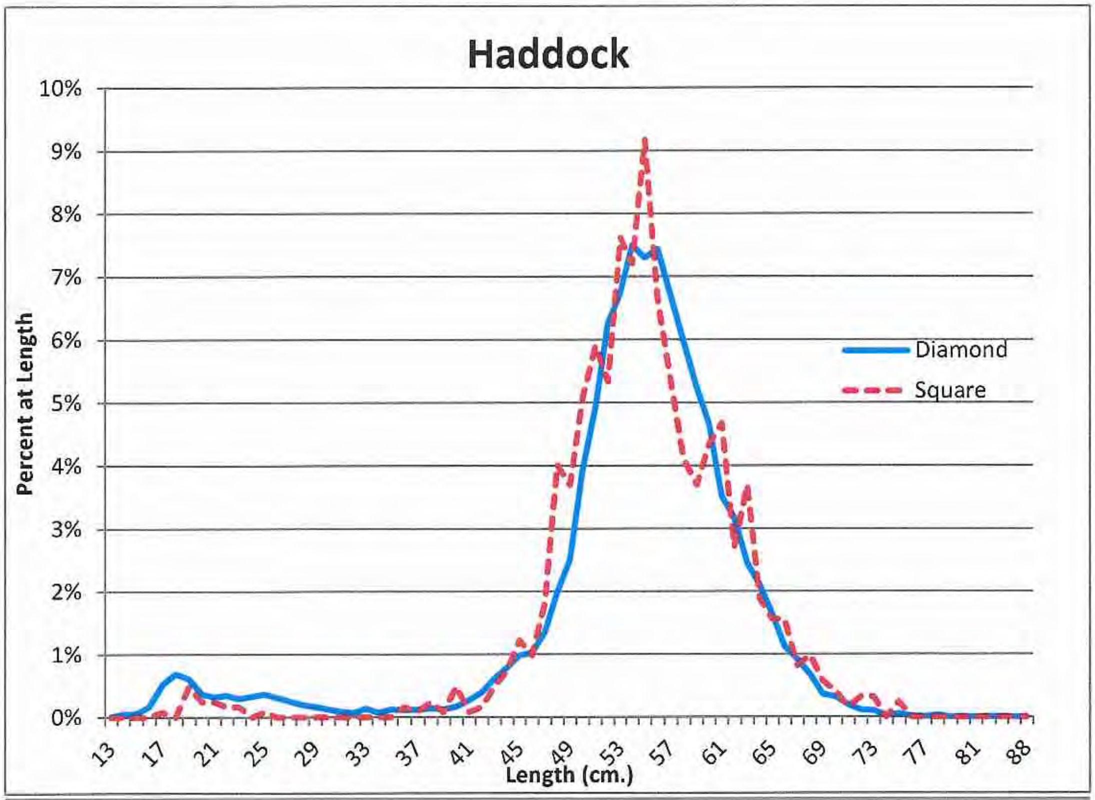


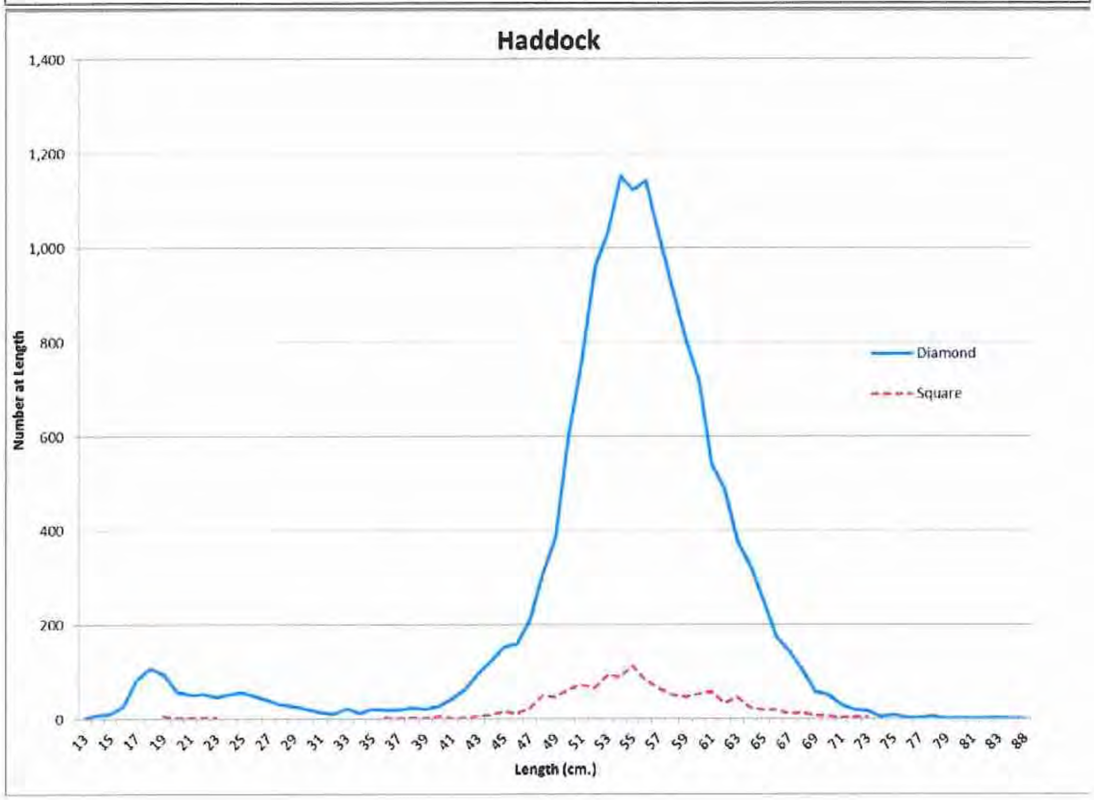
Figure 3 – Length-frequency of key groundfish species with different trawl mesh configurations

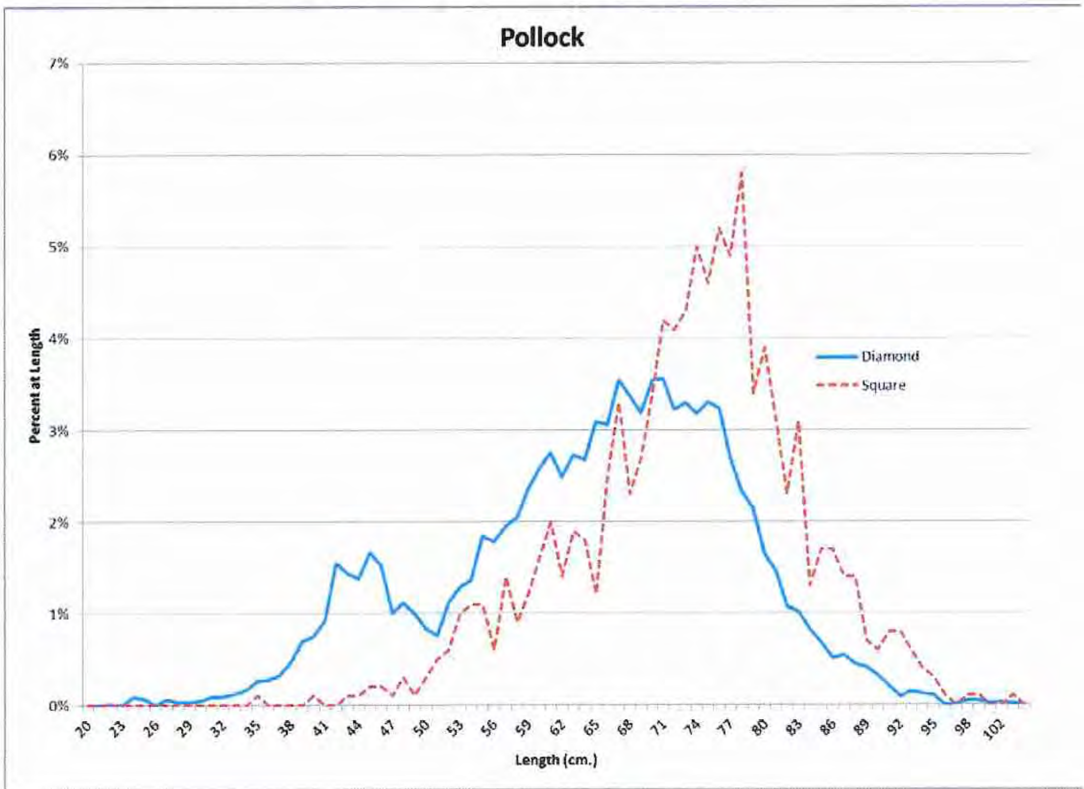


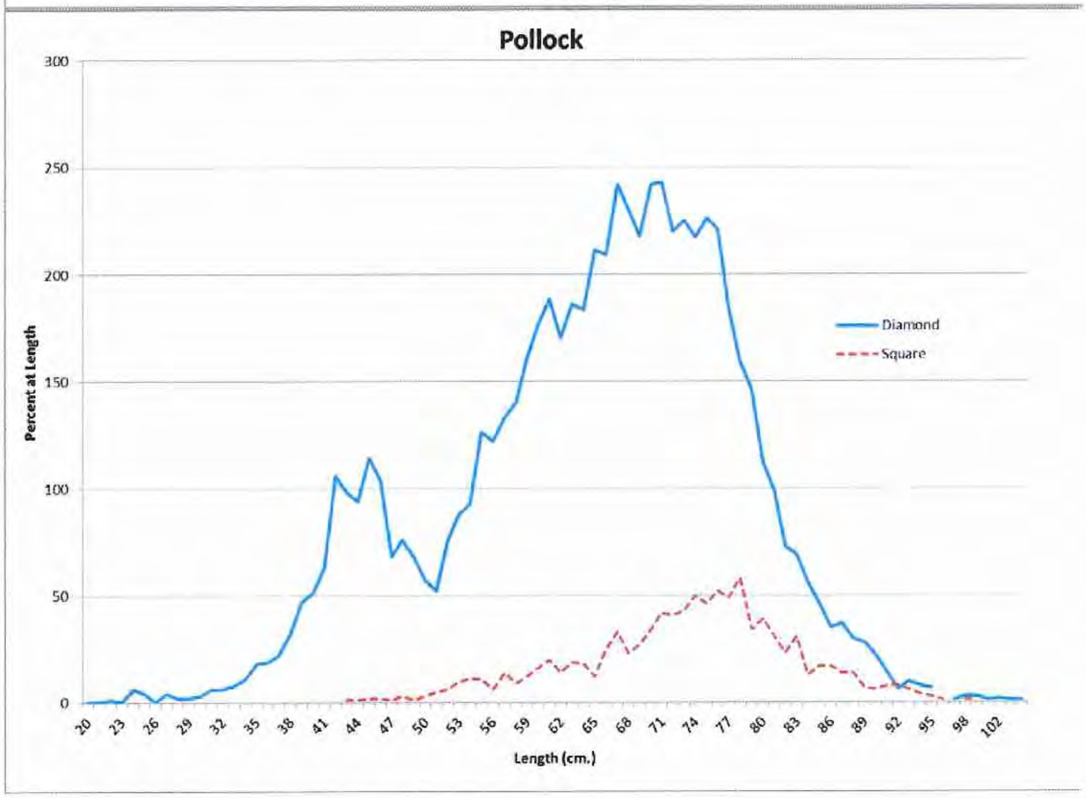


May 25, 2012
Enclosure (5) to Groundfish PDT report dated July 27, 2012

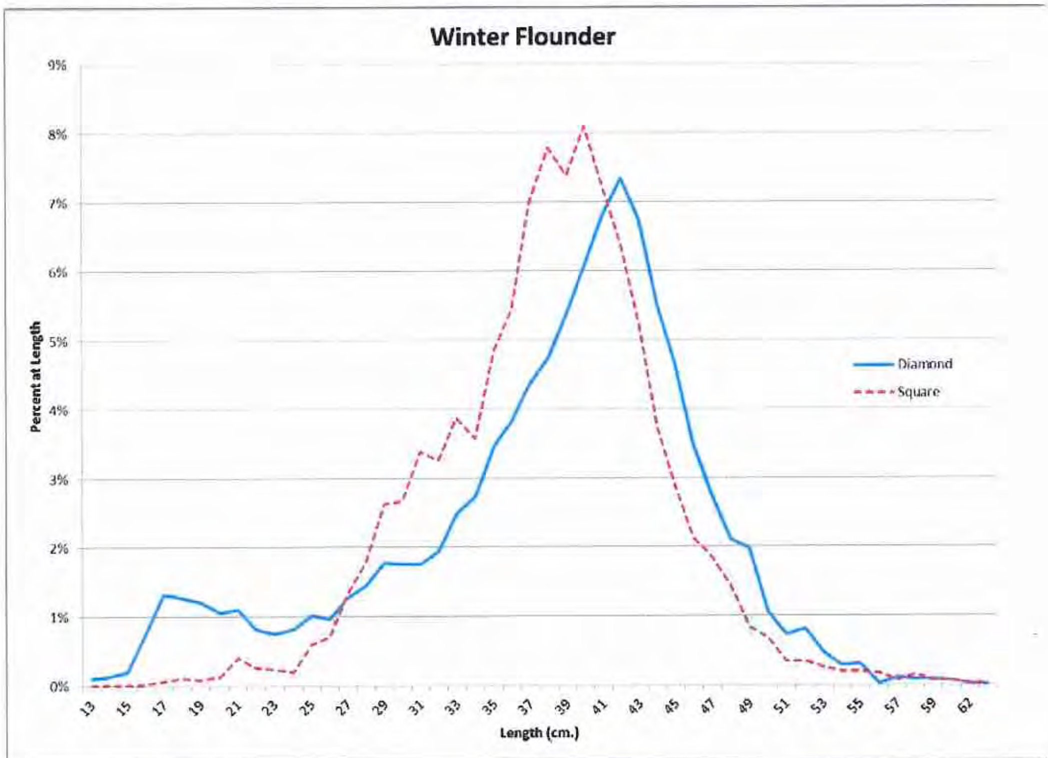


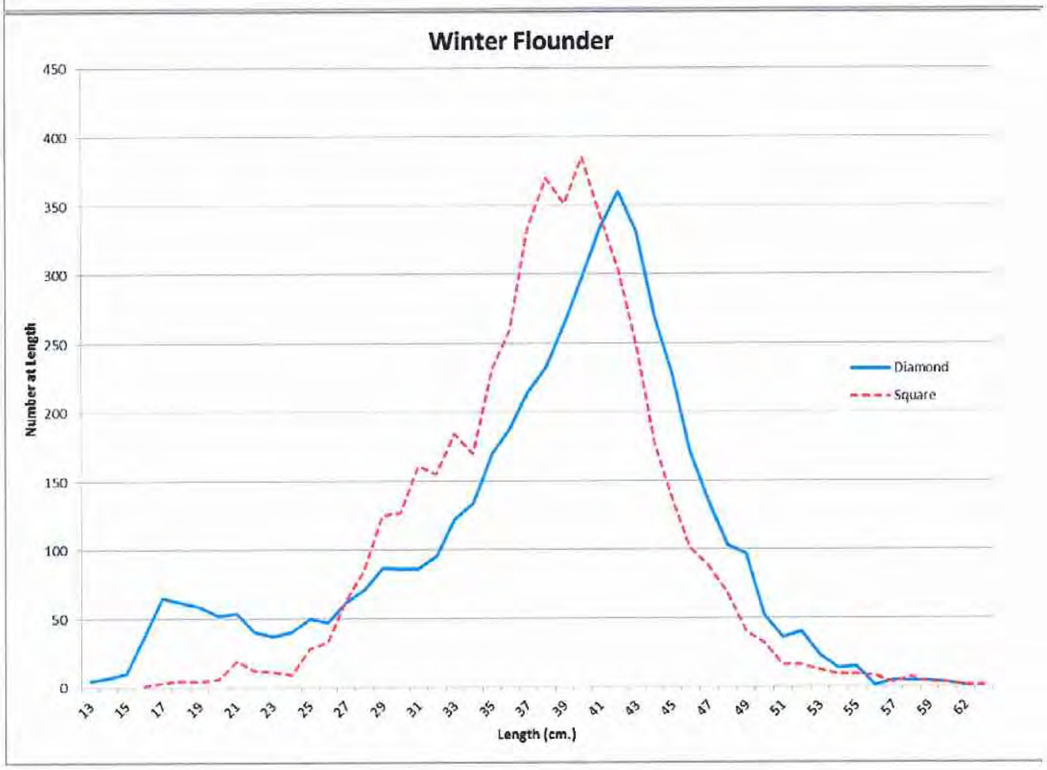


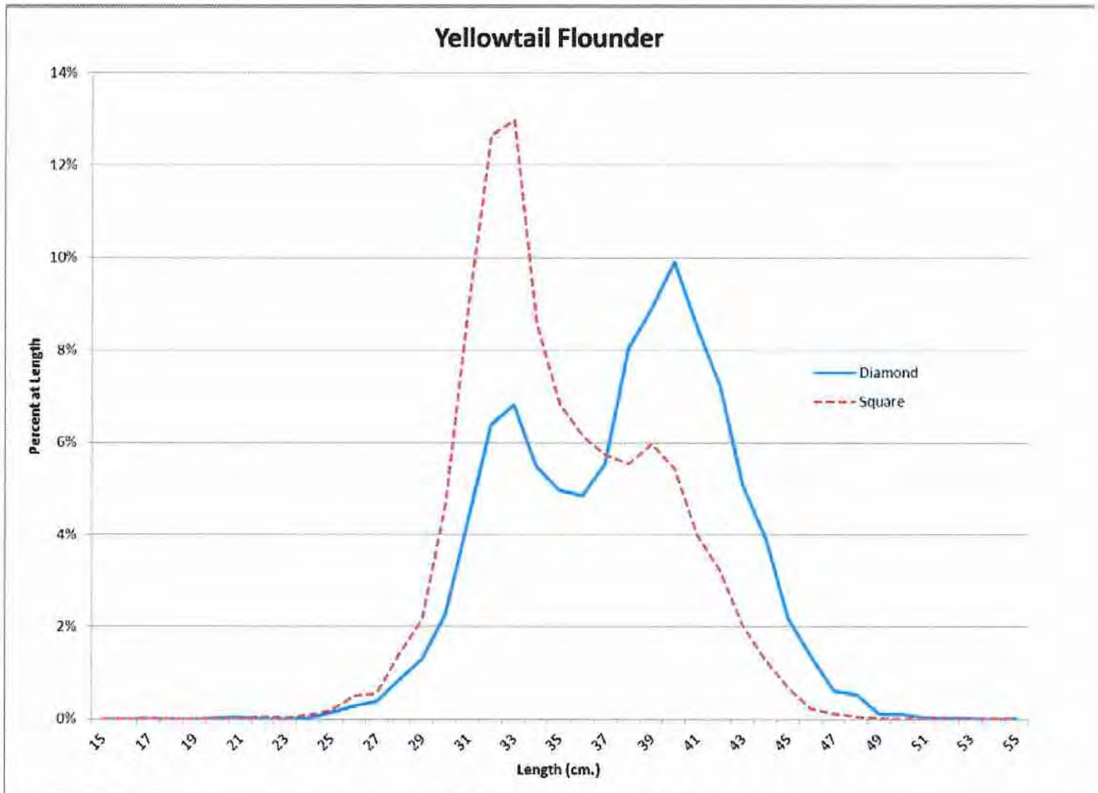

Pollock
Percent at Length
7%
6%
5%
4%
3%
2%
1%
0%
Diamond
Square
Length (cm.)

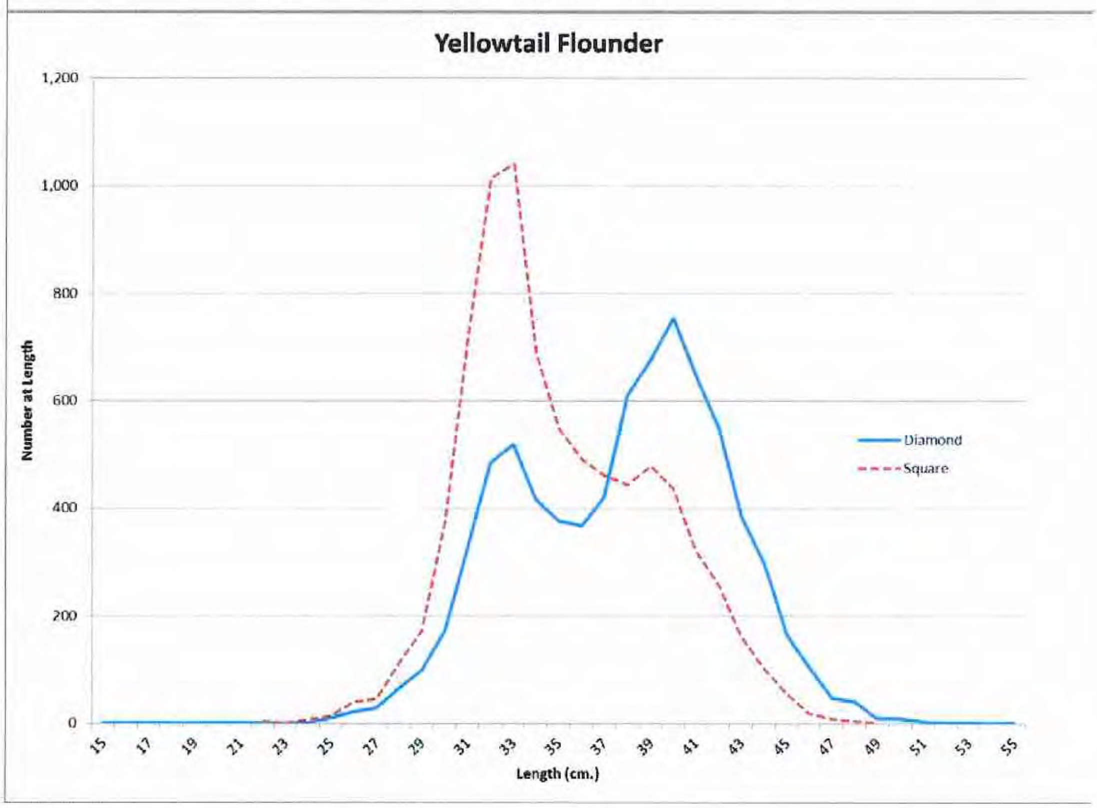

Pollock
Percent at Length
300
250
200
150
100
50
0
Diamond
Square
Length (cm.)

May 25, 2012
Enclosure (5) to Groundfish PDT report dated July 27, 2012

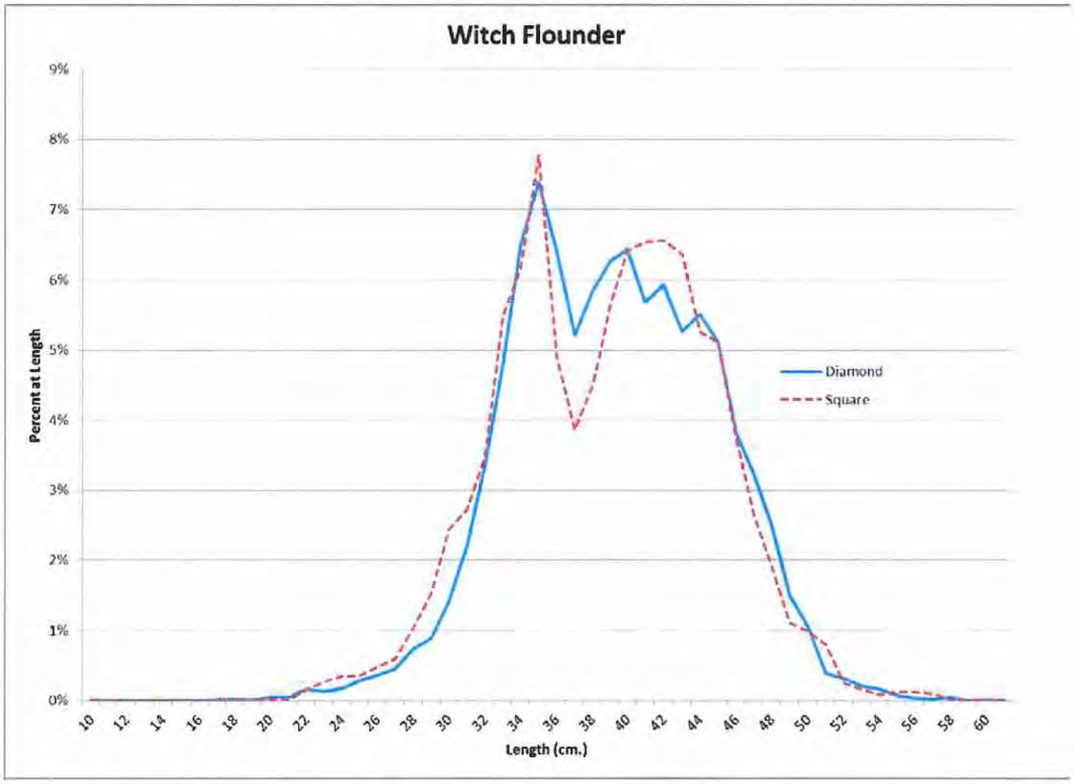


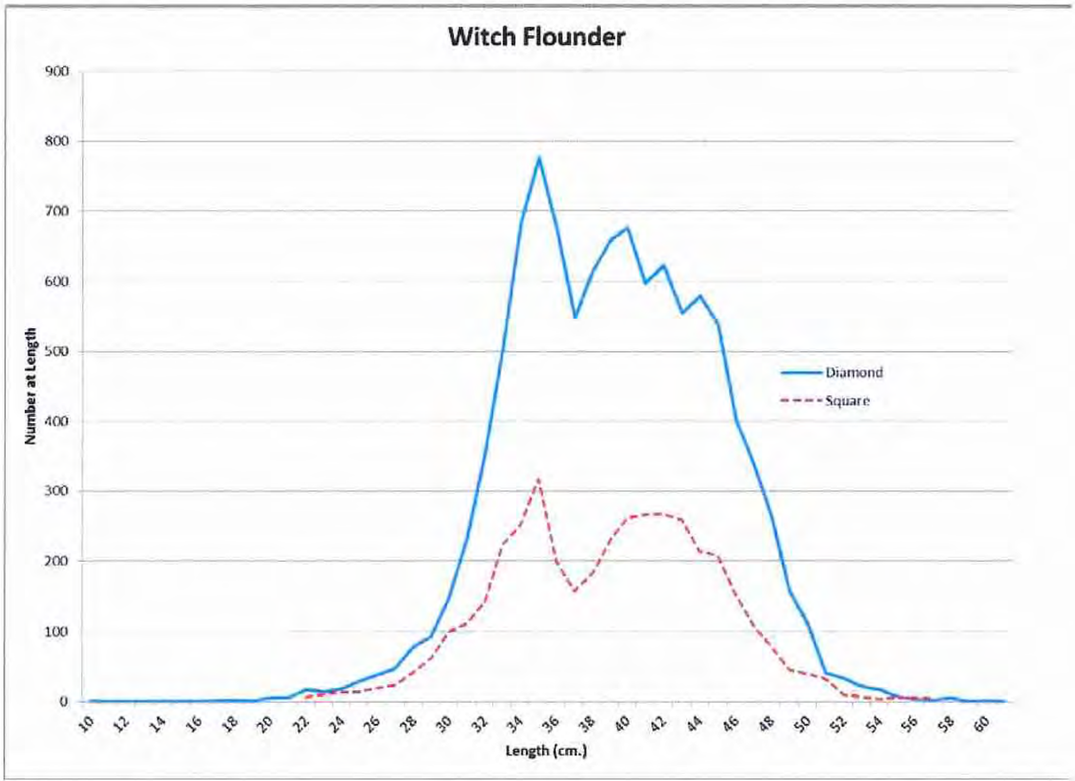



Yellowtail Flounder
14%
12%
10%
8%
6%
4%
2%
0%
Percent at Length
Diamond
Square
15
17
19
21
23
25
27
29
31
33
35
37
39
41
43
45
47
49
51
53
55
Length (cm.)

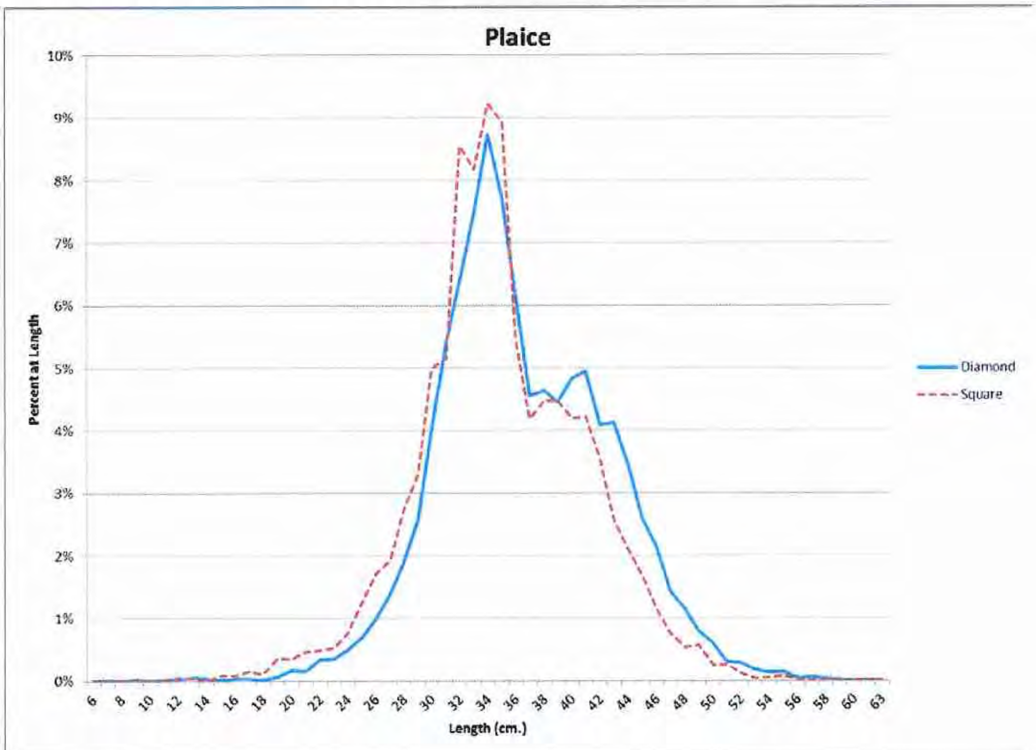

Yellowtail Flounder
1,200
1,000
800
600
400
200
0
Number at Length
Diamond
Square
15
17
19
21
23
25
27
29
31
33
35
37
39
41
43
45
47
49
51
53
55
Length (cm.)

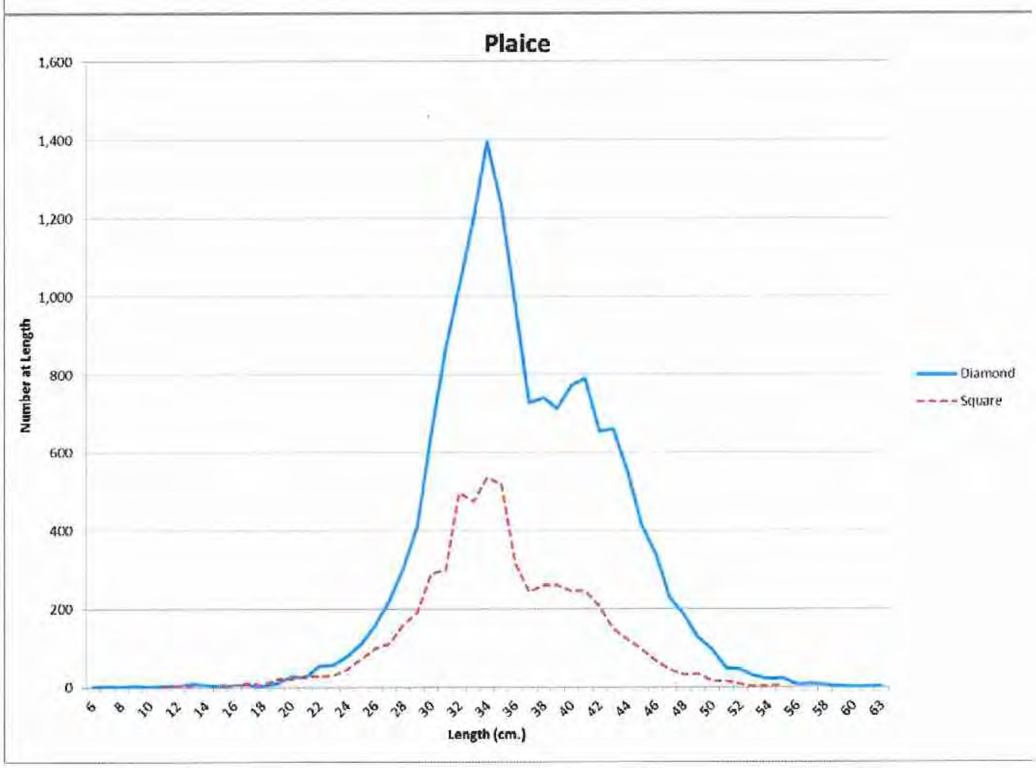
May 25, 2012
Enclosure (5) to Groundfish PDT report dated July 27, 2012





May 25, 2012
Enclosure (5) to Groundfish PDT report dated July 27, 2012





May 25, 2012
Enclosure (5) to Groundfish PDT report dated July 27, 2012

Figure 4 – Percent of observed large mesh otter trawl tows retaining groundfish that used one of four reported mesh configurations