

SUMMARY OF ANALYSES CONDUCTED
TO DETERMINE AT-SEA MONITORING
REQUIREMENTS FOR
MULTISPECIES SECTORS
FY2021

INTRODUCTION

The Greater Atlantic Regional Fisheries Office (GARFO) Analysis and Program Support Division provides evidence herein that the total monitoring coverage for Northeast multispecies sectors in fishing year (FY) 2021 would need to be **33 percent** of sector trips to achieve the Coefficient of Variation of 30% (CV30) or better precision at the overall stock level for each groundfish stock.

This analysis uses data available through the end of FY 2019 (April 30, 2020) that includes 11,624 sub-trips involving 15,612 full sea days of fishing effort eligible for sector monitoring. As in previous years, we will publish this summary of our analysis on the GARFO website.

The Fisheries Sampling Branch (FSB) at the Northeast Fisheries Science Center collects, maintains, and distributes data from fishing trips that carry at-sea monitors or electronic monitoring equipment. FSB manages two separate but related monitoring programs: the Northeast Fisheries Observer Program (NEFOP) and the At-Sea Monitoring (ASM) Program. Although each program is tailored to meet specific monitoring objectives, the programs function similarly. The NEFOP program's resources are finite, and FSB relies on national priorities (endangered or protected species), fishery management priorities determined by the New England and Mid-Atlantic Fishery Management Councils, and scientific priorities related to stock assessments to determine priorities for the NEFOP observer program. These program priorities, and the Standardized Bycatch Reporting Methodology (SBRM) that identifies relative fleet contribution to discards, guide the allocation of NEFOP coverage to fishing trips.

In previous years, FSB has provided us with an estimate of the NEFOP coverage they expect to provide sector vessels in the upcoming fishing year. That estimate is not available at this time, so this recommendation specifies the "total monitoring coverage," whether provided by NEFOP or ASM. As in previous years, sectors are required to design, implement, and pay their costs for any portion of the coverage not funded by the agency.

The Council has modified the monitoring requirements for northeast multispecies sectors several times since they were established in Amendment 16 to the Northeast Multispecies Fishery Management Plan, most recently in Framework 55, which became effective on May 1, 2016. The updated regulations at 50 C.F.R. § 648.87(b)(1)(v)(B)(1)(i) govern the monitoring coverage levels that may be required to monitor sector operations, to the extent practicable, to reliably estimate overall catch by sector vessels. These regulations require NMFS to specify coverage levels sufficient to achieve at least a CV of 30% at the overall stock level for each stock of regulated species and ocean pout. NMFS is required to use the most recent 3-year average of the total required coverage level necessary to achieve the CV30 threshold. The target coverage level

is the maximum stock-specific rate after considering criteria that allow for removing healthy stocks (no overfishing occurring and not overfished) with low relative catch and discards (<75% catch of previous year's sector sub-ACL and <10% discards) as rate determining stocks. If the target coverage level resulting from this screening is too low to achieve the CV30 standard, NMFS may set a different target coverage level to achieve the required standard.

When determining what stock-specific rate is necessary, NMFS is required to take into account the primary goal of the at-sea monitoring program of verifying area fished, catch, and discards by species and gear type by the most cost-effective means practicable. Other considerations include the equally weighted secondary groundfish monitoring goals and objectives, the MSA's national standards, and any other relevant factors. The total monitoring coverage ultimately should reasonably produce catch estimates that are accurate enough to ensure that overfishing is prevented while there is sufficient fishing opportunity to achieve optimum yield. To that end, additional uncertainty buffers are established when setting ACLs to help make up for any lack of absolute precision and accuracy in estimating overall catch by sector vessels.

OBSERVER COVERAGE REQUIREMENTS ANALYSIS SUMMARY

The total monitoring coverage is specified to achieve the required CV30 precision standard for the discard estimates for each Northeast multispecies stock for all sectors and gears combined, using the same target coverage level for each sector. This aggregate analysis incorporates the more refined strata (sector, gear, stock area) used to support annual catch entitlement (ACE) monitoring and ACE trading at the individual sector level, and allows a reasonable level of precision across those strata. The realized CV for each stock will be lower (more precise) than CV30 for some strata and higher (less precise) for others. However, with limited activity in some strata, assuring each individual stratum receives enough monitoring to calculate a discard rate with CV30 through random sampling would require impracticably high levels of monitoring coverage at an unacceptable cost. There is a tradeoff between the costs of additional monitoring coverage and the benefits of increasing precision. Increasing coverage to achieve greater precision in strata with limited activity creates additional costs to precisely measure discard rates in strata that may generate a small amount of the total discards.

As in previous years, we do not establish different coverage requirements for each sector or for other sub-stock strata, such as gear type.

Different coverage requirements for each sector or other sub-stock strata would likely increase monitoring coverage costs, the costs may not be equally apportioned between sectors, and it is uncertain that there would be meaningful improvements to catch estimation. Achieving the required CV standard depends on consistency of discard rates on trips within the same strata (sector/gear/stock area). Consistency between such strata does not normally occur and typically differs by sector. With limited activity in some strata, assuring each individual stratum receives enough monitoring to calculate a discard rate with CV30 through random sampling would require impracticably high levels of monitoring coverage in some strata, with attendant high costs. These high levels of monitoring coverage and costs would likely vary between sectors and substantially raise overall monitoring costs. Differing economic impacts would affect similar

vessel operations due to their choice of different sectors. Last, increasing coverage to achieve the precision standard in a stratum with limited activity increases costs substantially to precisely measure discard rates in a stratum that likely generates a disproportionately small amount of the total discards.

Table 1 shows results from our analysis which indicate that necessary coverage rates to achieve CV30 have varied for individual stocks over the past 10 years. The column headed “CV” shows the realized CV for each stock in each of the fishing years. The column headed “percent coverage” shows the necessary coverage rate to achieve CV30 for each stock in each of the fishing years. For each year, the shaded cells show the stock that this retrospective analysis indicates required the highest level of monitoring coverage to achieve CV30. Note, the east/west distinctions for Georges Bank cod and haddock are for informational purposes only and are not acknowledged as formal stocks used in the decision-making process.

The highest coverage rates that were necessary to achieve CV30 for any stock in the past 9 years were redfish in FY 2014 and GB winter flounder in FY 2016, both at 38 percent.

Table 1. Realized CVs and Percent Coverage Needed to Achieve CV30

STOCK	FY2010		FY2011		FY2012		FY2013		FY2014		FY2015		FY2016		FY2017		FY2018		FY2019	
	CV	% Cov.	CV	% Cov.	CV	% Cov.	CV	% Cov.	CV	% Cov.	CV	% Cov.	CV	% Cov.	CV	% Cov.	CV	% Cov.	CV	% Cov.
GB Cod East	9.73	4	15.44	12	20.44	11	48.86	29	24.60	15	28.05	18	76.38	53	68.01	44	26.66	28	33.07	26
GB Cod West	6.27	3	9.85	5	12.26	5	15.43	7	17.11	10	12.78	5	22.94	6	17.27	5	23.89	9	12.02	3
GB Cod	5.61	2	8.39	4	10.55	4	14.80	6	14.65	8	12.17	4	24.24	7	18.60	6	19.03	6	12.09	3
GOM Cod	4.74	2	4.74	2	9.89	4	6.07	2	11.16	6	18.80	10	14.41	3	25.17	12	8.81	3	23.47	21
Plaice	4.96	2	4.36	1	5.52	1	6.51	2	7.35	2	7.74	2	10.50	1	9.14	2	7.68	2	5.61	1
GB Winter Flounder	16.29	9	27.67	22	21.30	9	23.02	11	20.79	12	41.57	26	64.45	38	47.10	29	34.67	29	31.50	25
GOM Winter Flounder	10.56	7	8.81	4	8.96	3	15.10	7	29.06	26	13.16	6	31.43	14	17.55	6	9.66	3	10.46	5
Witch Flounder	5.76	2	5.11	2	8.74	3	7.41	2	8.96	3	8.67	2	10.65	1	13.72	3	7.44	1	7.46	2
CC/GOM Yellowtail Flounder	8.66	5	6.90	3	7.80	2	9.31	3	14.10	8	9.80	3	12.03	2	14.44	4	12.94	4	8.30	2
GB Yellowtail Flounder	11.13	5	10.36	4	15.98	6	24.84	13	21.16	12	26.15	13	40.67	20	44.15	26	42.32	37	40.52	36
SNE/MA Yellowtail Flounder	13.95	11	9.39	5	12.91	5	31.45	22	23.20	17	20.15	9	38.44	21	35.05	27	25.29	19	19.06	15
GB Haddock East	12.73	7	17.36	14	35.04	25	30.17	14	10.64	4	19.89	10	19.81	7	39.29	21	14.61	10	25.24	17
GB Haddock West	13.31	10	10.10	5	27.08	18	13.00	5	9.95	4	10.58	3	8.68	1	19.30	6	12.65	3	12.69	4
GB Haddock	9.40	5	10.22	5	21.77	12	11.95	4	8.44	3	9.47	3	8.02	1	17.33	5	11.68	3	11.56	3
GOM Haddock	9.94	6	9.11	4	12.27	5	12.98	5	12.03	6	10.67	4	14.92	4	12.29	3	23.81	16	10.54	5
White Hake	9.21	5	7.76	3	13.00	5	11.81	4	15.36	8	15.44	6	30.15	10	18.85	6	15.45	6	11.00	4
Pollock	8.01	4	6.91	2	7.71	2	7.55	2	9.71	4	9.17	3	27.17	9	21.57	8	12.71	4	18.32	11
Redfish	11.51	7	8.98	4	13.85	5	21.23	10	41.69	38	15.59	6	16.44	3	22.45	8	12.66	4	8.52	3
SNE/MA Winter Flounder	10.61	8	12.85	8	15.44	8	21.21	13	16.69	11	10.66	4	20.51	5	18.94	6	17.00	5	12.82	4
Southern Windowpane	9.12	5	8.22	4	10.70	3	7.98	2	8.26	3	11.26	3	15.61	4	9.47	3	9.58	3	6.34	2
Northern Windowpane	13.22	9	9.04	4	11.01	4	16.69	7	12.75	5	16.49	7	15.76	3	25.10	10	13.65	5	26.57	20
Ocean Pout	9.69	5	9.38	4	11.70	4	11.57	3	16.50	8	19.01	8	36.05	14	16.85	5	16.99	7	17.45	10
Halibut	6.34	3	6.95	2	6.68	2	7.51	2	6.67	2	12.06	4	18.86	4	11.61	2	15.92	6	14.79	7
Wolffish	6.66	3	7.00	2	8.35	2	9.58	3	9.75	4	12.00	4	13.00	2	15.05	4	13.81	5	8.87	3

Using prior 3 years of data to determine coverage rate

In previous years, information from the most recent full fishing year was used to recommend the total monitoring coverage target for the upcoming fishing year. The approach was developed in the initial years of the monitoring program when multiple years of data were not available. Since FY 2016, the recommendation is based on the most recent 3 years of data that are averaged to smooth assumed random inter-annual fluctuations of the discard variability estimates for each stock.

Table 2 presents the results of the averaging method. If this were the final step in developing a recommendation, the coverage requirement would be 33 percent of trips, based on the result for GB yellowtail flounder. The next step in developing the recommendation requires filtering out healthy stocks with relatively low catch and discards.

Table 2. Three-year Average of Required Coverage

STOCK	3-year Average of Required Coverage					
	FY2012 - FY2014	FY2013 - FY2015	FY2014 - FY2016	FY2015 - FY2017	FY2016 - FY2018	FY2017 - FY2019
GB Cod East	18	21	28	38	41	33
GB Cod West	7	7	7	5	7	6
GB Cod	6	6	6	6	6	5
GOM Cod	4	6	6	8	6	12
Plaice	2	2	2	2	1	1
GB Winter Flounder	11	16	25	31	32	28
GOM Winter Flounder	12	13	15	9	8	5
Witch Flounder	2	2	2	2	2	2
CC/GOM Yellowtail Flounder	4	5	4	3	3	3
GB Yellowtail Flounder	10	13	15	20	28	33
SNE/MA Yellowtail Flounder	15	16	15	19	22	20
GB Haddock East	14	9	6	13	13	16
GB Haddock West	9	4	2	3	3	4
GB Haddock	6	3	2	3	3	4
GOM Haddock	6	5	4	4	8	8
White Hake	6	6	8	7	7	5
Pollock	3	3	5	6	7	8
Redfish	18	18	15	6	5	5
SNE/MA Winter Flounder	11	9	6	5	5	5
Southern Windowpane	3	3	3	3	3	3
Northern Windowpane	5	6	5	7	6	11
Ocean Pout	5	7	10	9	9	7
Halibut	2	3	3	4	4	5
Wolffish	3	3	3	3	4	4

Filtering out healthy stocks with relatively low catch and discards

Healthy stocks are defined as those that are not overfished, with overfishing not occurring, according to the most recent available stock assessment. Stocks with relatively low catch and discards are those that in the previous fishing year have less than 75 percent of the sector sub-ACL harvested and less than 10 percent of catch comprised of discards.

The most recent stock assessment status determinations are shown in Table 3 below. Given that GB yellowtail flounder is overfished with overfishing occurring, it would not be filtered as a healthy stock and, thus, would serve to determine the coverage rate.

Table 3. Stock status

Stock	2017/2019 Assessments	
	Overfishing?	Overfished?
GB Cod	Yes ¹	Yes
GOM Cod	Yes	Yes
GB Haddock	No	No
GOM Haddock	No	No
GB Yellowtail Flounder	Yes ¹	Yes
SNE/MA Yellowtail Flounder	No	Yes
CC/GOM Yellowtail Flounder	No	No
American Plaice	No	No
Witch Flounder	Unknown	Yes
GB Winter Flounder	No	Yes
GOM Winter Flounder	No	Unknown
SNE/MA Winter Flounder	No	Yes
Acadian Redfish	No	No
White Hake	No	Yes
Pollock	No	No
Northern Windowpane Flounder	No	Yes
Southern Windowpane Flounder	No	No
Ocean Pout	No	Yes
Atlantic Halibut	No ¹	Yes
Atlantic Wolffish	No	Yes

¹ Biological reference point cannot be estimated. The official stock status is based on the last assessment where a reference point (status determination criteria) could be estimated.

ADDITIONAL CONSIDERATIONS

While a total monitoring coverage target level is expected to meet the CV30 standard on discard estimates, there is no guarantee that the required coverage level will be met or result in a 30-percent CV across all stocks due to changes in fishing effort and observed fishing activity that may happen in a given fishing year. Due to fluctuations in fishing activity over the year, it is difficult to deploy observers throughout the year and ensure that target coverage levels are attained. As Table 4 indicates, the realized level of coverage was below the target for most years, aside from FYs 2014, 2016, 2017, and 2018.

Table 4. Target and realized coverage levels, FY 2010–FY 2019.

Fishing Year	NEFOP target coverage level	ASM target coverage level	Total target coverage level	Realized coverage level
FY 2010	8 %	30 %	38 %	32 %
FY 2011	8 %	30 %	38 %	27 %
FY 2012	8 %	17 %	25 %	22 %
FY 2013	8 %	14 %	22 %	20 %
FY 2014	8 %	18 %	26 %	25.7 %
FY 2015	4 %	20 %	24 %	19.8 %
FY 2016	4 %	10 %	14 %	14.8 %
FY 2017	8 %	8 %	16 %	17.3 %
FY 2018	5 %	10 %	15 %	14.6 %
FY 2019	N/A [†]	N/A [†]	31%	21.9%
FY 2020	N/A [†]	N/A [†]	40%	N/A*

[†] NEFOP rates are stratum-specific starting in FY 2019.

*Realized coverage not available; fishing year still underway.

Our achievement of the CV30 standard for all stocks was much poorer during the last few fishing years in comparison to the first six years of the monitoring program (Table 1). From the start of the monitoring program in 2010 through fishing year 2015, realized annual coverage levels resulted in a vast majority of the 20 groundfish stocks far exceeding the CV30 standard. Any shortfalls were limited to single stocks that had not experienced previous shortfalls. However, in fishing year 2016, six stocks fell short of meeting the CV30 standard. The shortfalls numbered 3 in FY 2017, 2 in FY 2018, and 2 in FY 2019.

We examined FY 2019 data in detail to evaluate the extent to which unobserved discards affect total catch by sectors. In FY 2019 (Figure 1), the total discards of the allocated groundfish stocks ranged from 0.29% of the total calculated catch for Georges Bank winter flounder to 10.49% for CC/GOM yellowtail flounder. Both Georges Bank cod and haddock are further subdivided into Eastern and Western components, and those values are also presented, despite the fact the total monitoring coverage recommendation is made at the overall stock level. Figure 1 illustrates that 89 percent or more of the total catch of each of the allocated stocks is comprised of dealer-reported landings, with the remaining 11 percent or less comprised of observed and

unobserved discards. Figure 2 shows that the discarded poundage (observed and unobserved) represents a relatively small percentage of the total stock-level sub-ACLs allocated to the sectors as a group.

Note that the catch of non-allocated groundfish stocks is theoretically composed entirely of discards, because no landings are allowed. The exception is Atlantic halibut since limited landings are allowed; for that stock the catch was 62% discard in FY 2019. Discards as a percentage of stock sub-ACLs are presented for both allocated stocks (Figure 2) and non-allocated stocks (Figure 3). Figure 4 further examines FY 2019 discards by showing pounds by stock, and percent of total discards for each stock. The large majority of total discards (>47%) are haddock.

Figures

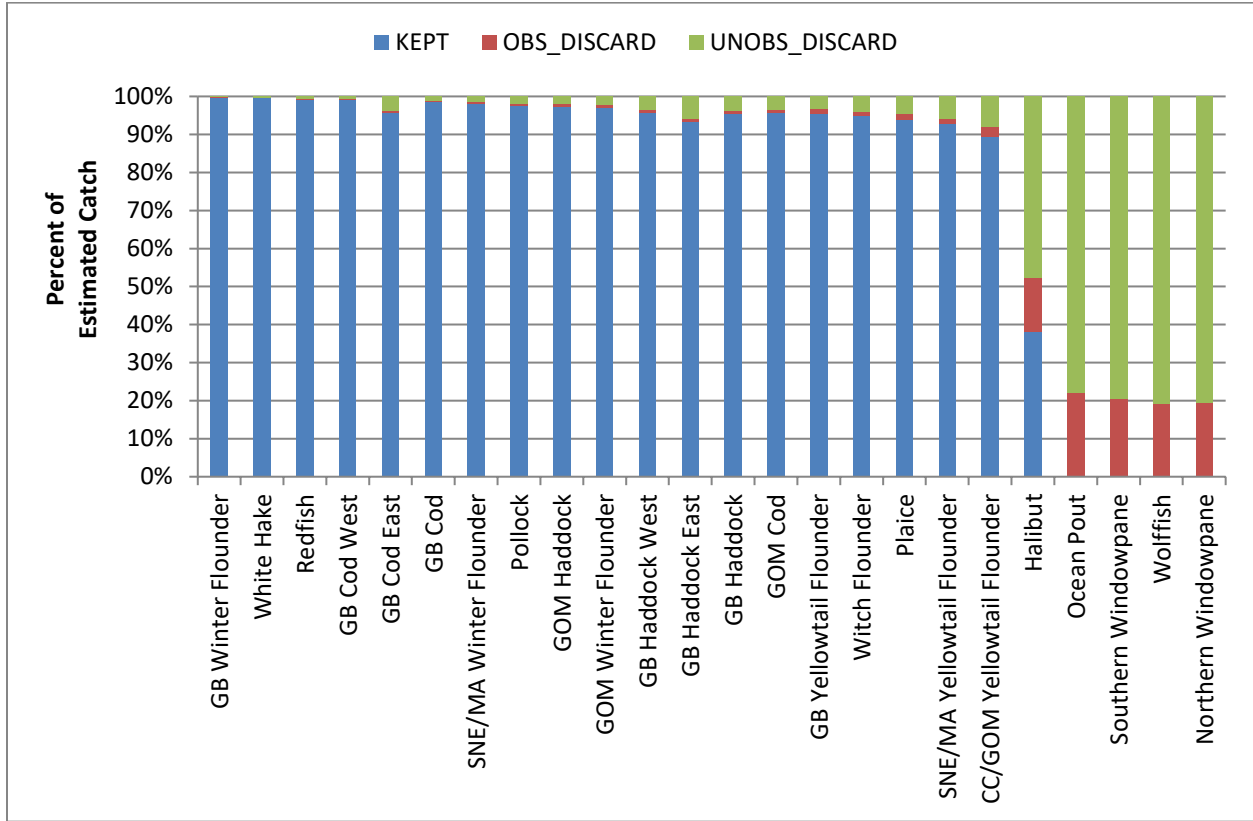


Figure 1: Fishing Year 2019 Groundfish Discards as a Percentage of Catch

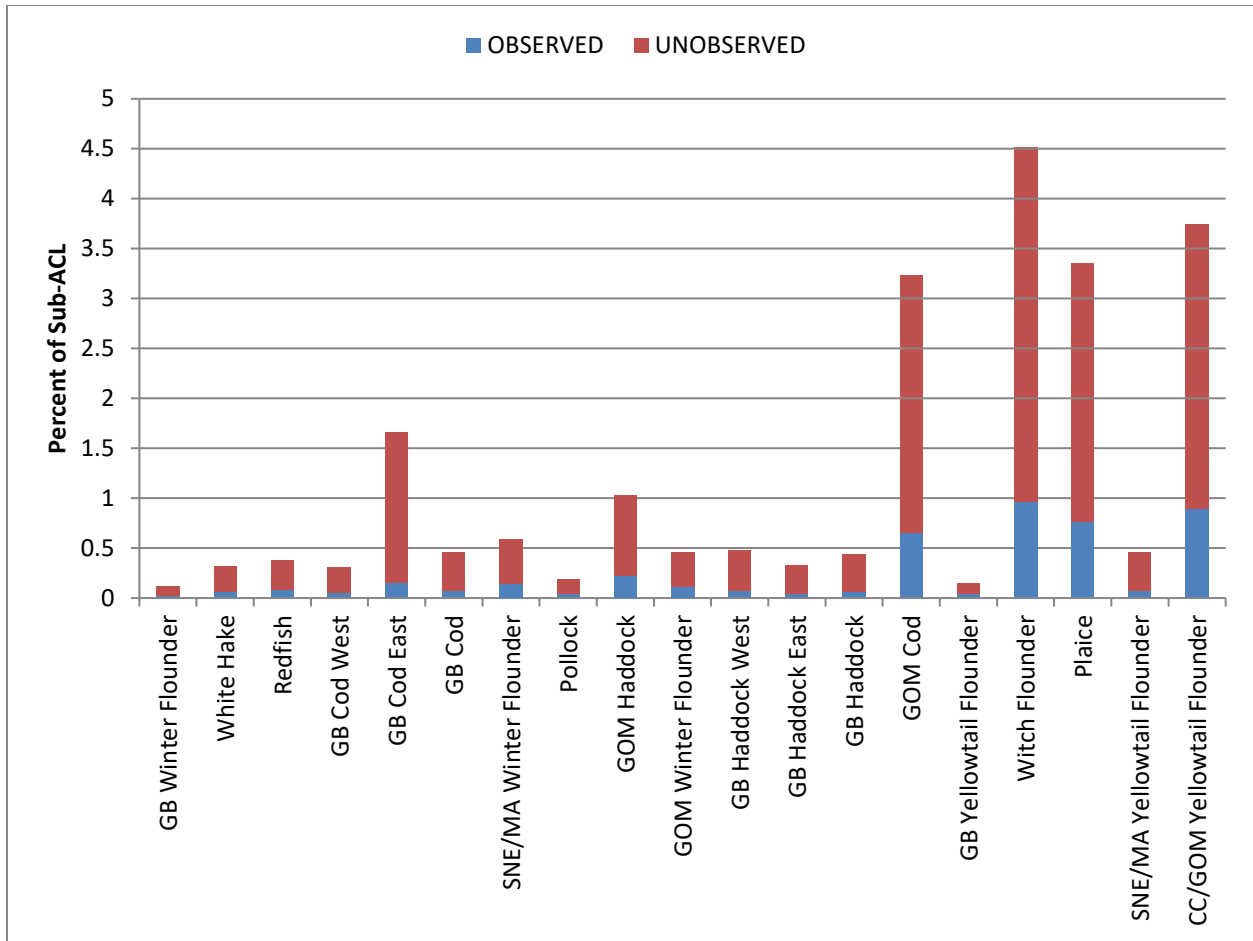


Figure 2: Fishing Year 2019 Allocated Groundfish Discards as a Percentage of Sub-ACL

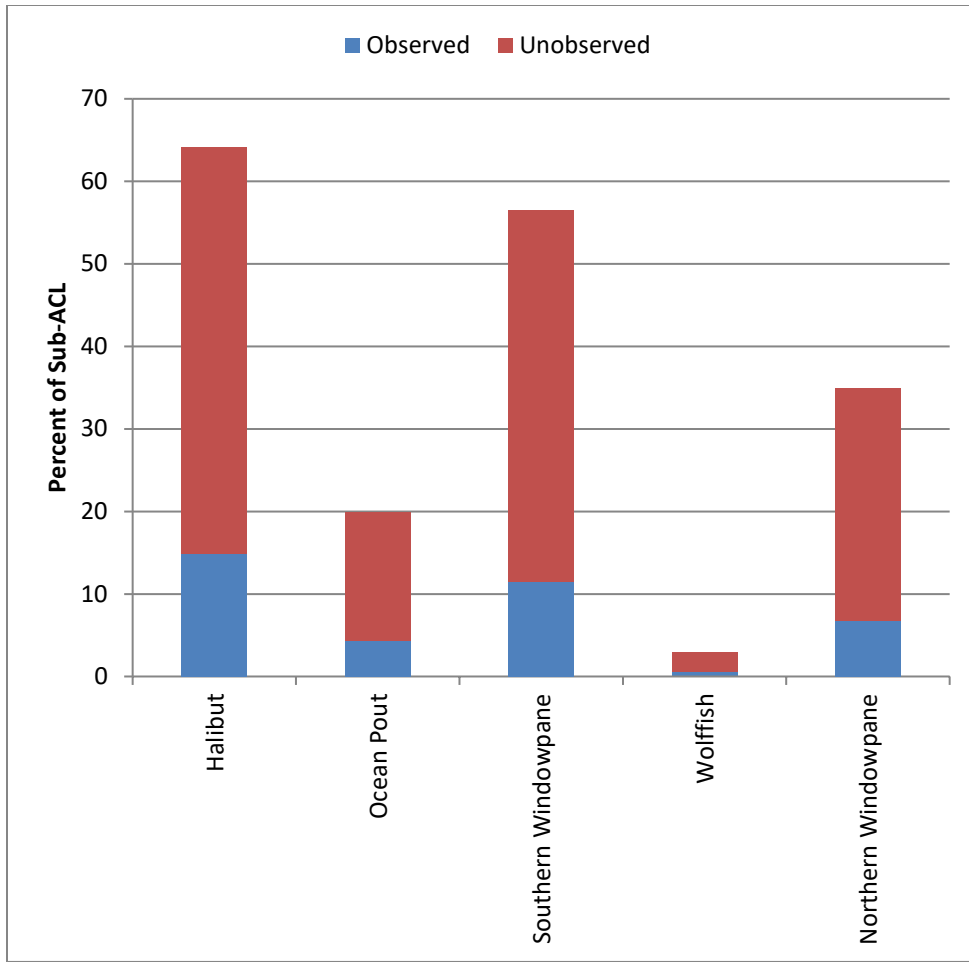


Figure 3: Fishing Year 2019 Non-allocated Groundfish Discards as a Percentage of Sub-ACL

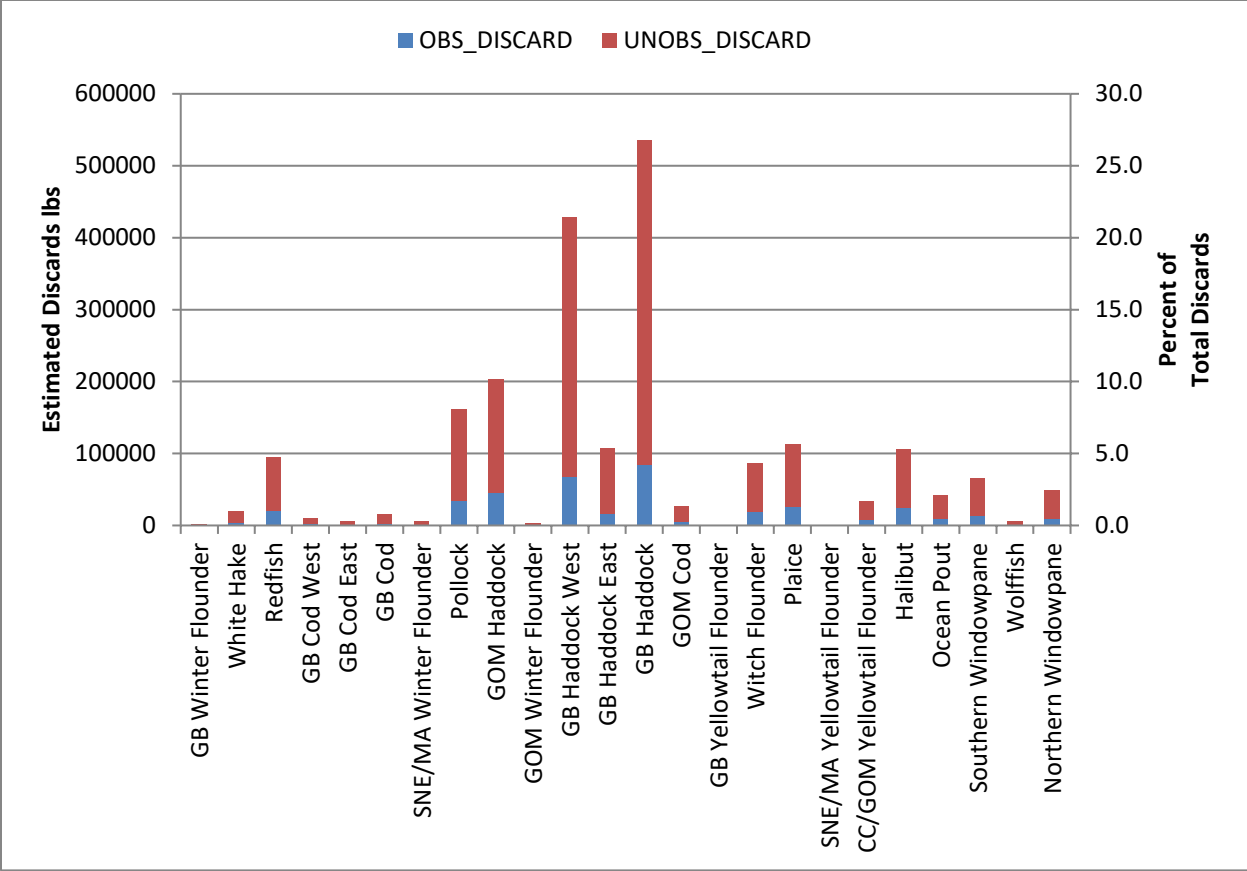


Figure 4: Fishing Year 2019 Discards (Live lbs and Percent of Total Discards)