Small Sablefish Release Update

May 23, 2023

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Executive Summary

In December 2019, the Council initiated an analysis to allow voluntary release of small sablefish in the Individual Fishing Quota (IFQ) fishery, in response to testimony that large year classes of sablefish result in significant catches of small fish that have low commercial value. An initial review draft was presented to the Council in February 2021 but was not released by the SSC for final action as the draft lacked sufficient analysis to understand the potential impacts of the action on the productivity of the sablefish stock and stock assessment uncertainty. Further work on the analysis was postponed pending staff time and resources, but Council members and the public continue to be interested in moving this action forward. This paper provides perspective on the challenges and tradeoffs associated with analyzing and implementing this proposed management change, so that the Council can assess the priority that Council and National Marine Fisheries Service (NMFS) staff should give to further work on this issue.

As described in the SSC report from February 2021, allowing voluntary release of sablefish introduces significant uncertainty into the sablefish stock assessment, as limited information would be available to determine 1) what size/age fish would be discarded, and 2) the survival rate of released fish. It is expected that there will be a direct influence on the Acceptable Biological Catch (ABC) recommendation for sablefish, to be more conservative in the face of uncertainty and to account for a shift in effort towards larger, more mature fish. Because of the additional workload required to reconfigure the sablefish assessment to address discards occurring in the target fishery, other Council priorities for sablefish may be delayed (e.g., accounting for increasing pot gear usage, spatial modeling initiatives, and work related to redefining harvest control rules in light of environmental changes).

Allowing for voluntary release of sablefish also changes one of the fundamental design provisions of the IFQ program. The full retention requirement for sablefish IFQ allows the Council and NMFS to use a largely enforcement-based program for preventing underreporting of catch and ensuring conservation and management of the sablefish stock, consistent with National Standard 1. Allowing voluntary release may require NMFS to implement a monitoring-based program for sablefish, as is in place for other Council-managed fisheries that allow discards. The Council uses observers or electronic monitoring (EM) to ensure accurate accounting of discards in trawl fisheries where sablefish discarding occurs, and the halibut IFQ fishery, as well as sablefish fisheries off the West Coast, use dockside catch monitoring, port sampling, and at sea monitoring as mechanisms for accounting. It is possible to design and implement additional monitoring for the sablefish fishery, however the workload is significant, and additional monitoring in the sablefish fishery would require less monitoring of other fleets or specific priorities in the partial coverage sector.

This paper provides a range of direction to staff that the Council might consider, from continuing with the alternatives as currently articulated, changing the alternatives to consider a required rather than voluntary discard requirement (a minimum size limit), or ceasing work on this analysis. Descriptions of the relative implications for workload, timeline, sablefish stock conservation, reprioritized monitoring needs, and potential implications for the fishery are provided.

1 Introduction

This paper is intended to assist the Council in evaluating how to prioritize preparation of a second initial review analysis of the Council's current alternatives for small sablefish release, given the required workload and changing conditions (environmental uncertainty, stock status, changes in fishery) since the Council originally initiated analysis on this topic. Included in this update are: 1) a history of the action and a summary of findings from the previous analysis (NPFMC 2021), 2) a description of new information since the Council last reviewed the analysis in February 2021, including: changes in the sablefish stock and in the sablefish IFQ fishery and market, and 3) considerations for future analysis and decision making. This includes a comparison of the analysis produced by Dr. Ian Knuckey to the 2021 analysis (NPFMC 2021), monitoring considerations, and assessment-related considerations. Additionally, this update includes a description of the workload and resources required to adequately address remaining Scientific and Statistical Committee (SSC) recommendations and associated tradeoffs of proceeding with analysis. Much of the information included in this paper builds upon previous documents,[1,2,3,4] which provide a comprehensive understanding of the history and analysis of this action beyond that included in Section 1.1.

[1] October 2018 Discussion Paper
[2] April 2019 Discussion Paper
[3] December 2019 Discussion Paper
[4] February 2021 Initial Review Analysis

1.1 History of Action

At present, the IFQ sablefish longline and pot fisheries in the Gulf of Alaska (GOA) and Bering Sea/Aleutian Islands (BS/AI) require full retention of sablefish. Beginning in 2017, unprecedented numbers of newly recruited sablefish began showing up in the GOA and BS fixed gear catches, initiating stakeholder appeal for management action to provide relief from the prohibition on sablefish discarding in the sablefish IFQ fleet. In April 2018, IFQ fishermen provided testimony to the Council that they were seeing a sudden influx of small, low-value sablefish in their catch. These fish were becoming an economic burden to fishermen because regulations prevent them from being discarded, even though, according to testimony, these fish were mostly uninjured by the fishing gear and appeared likely to survive if released. IFQ stakeholders at the meeting proposed that the Council explore an allowance to discard these fish, and the Council initiated the first of three discussion papers to explore issues related to this proposal.

In October 2018, the Council reviewed the first of three discussion papers that evaluated:

- Effects of the exceptionally large 2014 and 2016 sablefish year classes.
- Sablefish discard mortality rate (DMR) estimates.
- Management considerations to the IFQ program.
- Changes to observer sampling protocols.
- Enforcement implications.

The paper also considered the contrast between a *requirement* to discard sablefish under a certain size (minimum size limit) and an *option* for discretionary release (voluntary discarding) in terms of both practical and economic impacts. A requirement to discard sablefish under a certain size would continue to require retention of all fish over that size limit. Voluntary discarding would allow for harvesters to choose what sizes of fish they would prefer to retain and could result in any size of fish being legally discarded.

In April 2019, the Council received a second discussion paper that evaluated:

- A process for establishing DMRs.
- An assessment of temporary proxy DMRs.
- Allowing discards during years of high abundance versus years of lower abundance.
- Whale depredation if discarding is allowed.
- Gear modifications that could aid in avoiding small sablefish.
- The implications of approaching the Total Allowable Catch (TAC) or exceeding the ABC.
- Fishing down the existing spawning stock.
- Impacts of highgrading.
- Enforcement options.

The Council then requested a third discussion paper, reviewed in December 2019, that addressed:

- Mandatory vs. optional release.
- Varying size limits by area.
- Accounting for discards within ABC and TAC.
- Specific options for proxy DMRs.
- DMR variability by gear.
- Discard estimation methods and the associated monitoring and enforcement concerns.
- Impacts of discarding on sablefish abundance and how that affects allocations to IFQ and trawl sectors.

In December 2019, the Council adopted a purpose and need statement and developed alternatives (Section 1.2) to initiate analysis on this issue. The initial review analysis was then considered at the January 2021 Enforcement Committee meeting (report) and February 2021 SSC, AP, and Council meetings.

The SSC recommended that additional analyses be conducted and included prior to any final action by the Council on this issue. Specifically, while the difficulties associated with the estimation of size or age distribution of discards were thoroughly considered in the analysis, the SSC concluded that there are two unresolved questions that are central to understanding the effects of the proposed amendment:

> 1. What is the impact on the age structure and overall productivity of the stock under different rates of discard mortality and for different gear and discard selectivity profiles?
>
> 2. What is the impact on the uncertainties in the stock assessment, and the required buffers in setting ABC, arising from knowledge gaps introduced by not knowing gear selectivity or discard selectivity and mortality in a mostly unobserved fishery?

The Council chose to postpone the action until it could consider recommendations from the IFQ Committee concerning the relative priority of this action. In April 2021, the IFQ Committee Report stated that "*the majority of the Committee thinks this action is a high priority that is worth the time to work through the stock assessment and catch accounting issues that were highlighted in the initial review draft."*

In October 2021, the Council made the following motion under staff tasking: *"When time, resources, and staff allow, direct staff to prepare and schedule for Council consideration a small sablefish release Initial Review document to be scheduled for an upcoming meeting."*

The May 2022 IFQ Committee (see May 2022 IFQ Committee Report) received further public comment on small sablefish in response to additional large year classes occurring and the continued issue of mandatory retention of all sablefish caught.

In June 2022, the Council supported the IFQ Committee's recommendation to schedule the next initial review of action to allow small sablefish release, noting that the Council Chairman and Executive Director would schedule that review as Council agenda time and NPFMC/NMFS Alaska Regional Office (AKRO)/Alaska Fishery Science Center (AFSC) staff resources allow. At that time, the Council expressed interest for the updated analysis to include recent data on recruitment, growth rates, and market conditions and to revisit the discussion on assessment uncertainty. In keeping with the IFQ Committee recommendation, the Council noted that the discussion in the previous analysis about a minimum size limit for sablefish retention should not be considered in the revised analysis.

In December 2022, the Executive Director indicated that in June 2023, the Council could expect to receive a "staff update" (this document) on small sablefish release for June 2023. The intent was not for a second iteration of an initial review analysis, but rather as mentioned above, to provide the Council with information that could assist in determining prioritization of the action amidst other Council priorities given limited Council, AFSC, and AKRO staff resources.

For clarity, this action has been referred to in several ways as it has evolved over time*: IFQ sablefish release allowance, sablefish discard allowance, small sablefish discarding, small sablefish retention, small sablefish release, voluntary careful release of sablefish.*

1.2 Council's 2019 Purpose and Need Statement and Alternatives

The Council's 2019 motion and subsequent analysis considered the following purpose and need and alternatives:

Purpose and Need

Large year classes of sablefish result in significant catches of small sablefish in the IFQ fixed gear fisheries. Small sablefish have low commercial value and current regulations require IFQ holders to retain all sablefish. Available data suggest that survival rates for carefully released sablefish are high. Operational flexibility to carefully release sablefish may increase the value of the commercial harvest and allow small fish to contribute to the overall biomass.

Alternative 1, No Action

Under the No Action alternative, all regulations and FMP language related to a prohibition on discarding sablefish would remain intact. Those regulations include 50 CFR 679.7(d)(4)(ii) and 50 CFR 679.7(f)(11) and a provision in both the BSAI and GOA Groundfish FMPs under General Provisions, section 3.7.1.7.

Alternative 2, Allow Voluntary Careful Release of Sablefish in the IFQ Fishery

This alternative would eliminate the regulatory restrictions that prohibit release of sablefish caught by sablefish IFQ vessels as well as the FMP provision prohibiting discarding.

Element 1: DMRs

Apply a DMR to discarded sablefish of:

1. 5%
2. 12%
3. 16%
4. 20%

Sub-option: Select different DMRs for pot gear and hook and line gear

Element 2: Catch Accounting

Option 1: Sablefish discards will be estimated using observer and EM data with a DMR applied annually as part of the specifications process.

Option 2: Sablefish discards will be estimated pre-season based on AFSC longline survey encounter rates of sub-three pound sablefish with the DMR applied annually as part of the specifications process.

Element 3: Discard Mortality Accounting

Sablefish discard mortality associated with the IFQ fishery will be accounted for in the stock assessment. The analysis should describe the potential implications of voluntary discards on the sablefish stock assessment and specifications process.

Element 4: Monitoring and Enforcement

The analysis should describe potential monitoring and enforcement provisions that could improve estimates of voluntary and regulatory discards.

1.3 Summary of Findings from the 2021 Initial Review Analysis (NPFMC 2021)

- The analysis examined a range of potential scenarios based on sizes of sablefish retained, including a minimum size limit based on 3 dressed lbs (how "small sablefish" was defined in NPFMC 2021) and a retention scenario based on processor size grade prices that may occur under a voluntary discarding program where any size of fish can be discarded. Stock related (e.g., spawning biomass) and economic (e.g., yield, ex-vessel value) impacts are dependent upon size of fish discarded and DMR (Section 2.2.3.3 in the 2021 analysis).

- Continued decline in market prices for smaller sablefish is creating suboptimal economic conditions (Figure 2-8 in the 2021 analysis; Table 2/Figure 5 in this document).

- Allowing the IFQ fishery to discard small sablefish in order to increase harvest of large sablefish would put increasing pressure on the spawning biomass (Section 3.2.2 of the 2021 analysis).

- Implementation of a voluntary discard program would greatly increase uncertainty in the sablefish stock assessment due to uncertainty in the DMR, retention selectivity (i.e., the percentage of fish at a given size or age that are retained), and a loss of information on young fish to inform recruitment estimates (Section 2.2.3.1 in the 2021 analysis).

- Implementation of a voluntary discard program will likely result in an overall decrease in ABC in order to account for modeled dead discards (Table 2-11 in the 2021 analysis).

- Impacts would vary based on management area based on differences in the size distribution of the population.

2 Updates Since 2021 Initial Review Analysis

2.1 Stock Status Updates

The sablefish stock continues to demonstrate similar increasing population trends as described when the Council received the initial review analysis in 2021. According to the most recent sablefish stock assessment, the 2023 age 2+ biomass was projected to be 678,562 mt (Goethel et al. 2022). Female spawning biomass is above B40% at 159,788 t (B52%) and is projected to increase rapidly in the near-term. The age and length composition data from the fisheries (i.e., fixed gear and trawl) and surveys (i.e., longline and trawl) continue to indicate strong year classes in 2014, 2016, 2017, 2018, and now in 2019.

As the 2016 year class enters the fully selected ages for the fixed gear fishery and longline survey, it is becoming clear that this recruitment event is likely the largest on record. Similarly, many of the 2014 – 2019 recruitment events appear to be of large magnitude and generally mimic late 1970s recruitment patterns, which led to strong biomass rebuilding in the 1980s. Based on the strength of these recent year classes, age-2+ biomass has almost tripled from a time series low of 228,000 t in 2015 to 665,000 t in 2022, sablefish population levels that have not been estimated since the early 1970s (Figure 1). Although growth in spawning stock biomass (SSB) has lagged compared to total biomass, given that recent year classes are not fully mature, SSB has still increased by 60% from the time series low of 84,000 t in 2017 to 134,000 t in 2022 (Figure 1). Thus, the current SSB is at 44% of the unfished SSB (i.e., SSB_{100}) in 2022.

SSB only increases rapidly if large year classes continue to be abundant at fully mature ages (e.g., age-10+). Because recruitment in the early 2000s had been weak for over a decade, the population has seen a precipitous decline in older, fully mature fish and fully grown fish since 2011 (Figure 2). The lack of sablefish greater than 10 years of age remains concerning for such an extremely long-lived species and needs to be carefully monitored. As recent year classes grow towards full maturity, the population age structure is beginning to expand. However, uncertainty exists for recent (i.e., 2017–2019) recruitment estimates, and it is important that each of these cohorts can survive in large numbers to fully mature ages to ensure long-term productivity (Goethel et al. 2022).

Figure 1 Estimated sablefish total biomass (top) and spawning biomass (bottom) with 95% Monte Carlo Markov Chain (MCMC) credible intervals. Values in kilotons. Source: Goethel et al. 2022

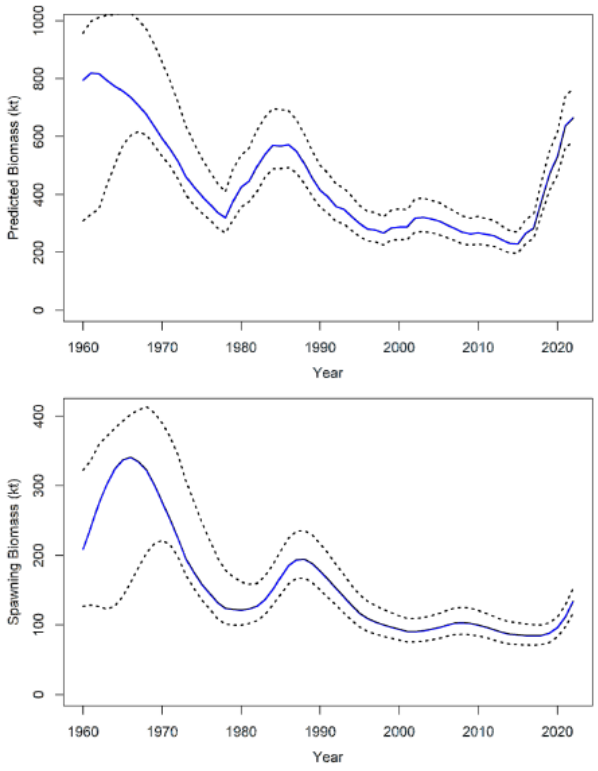
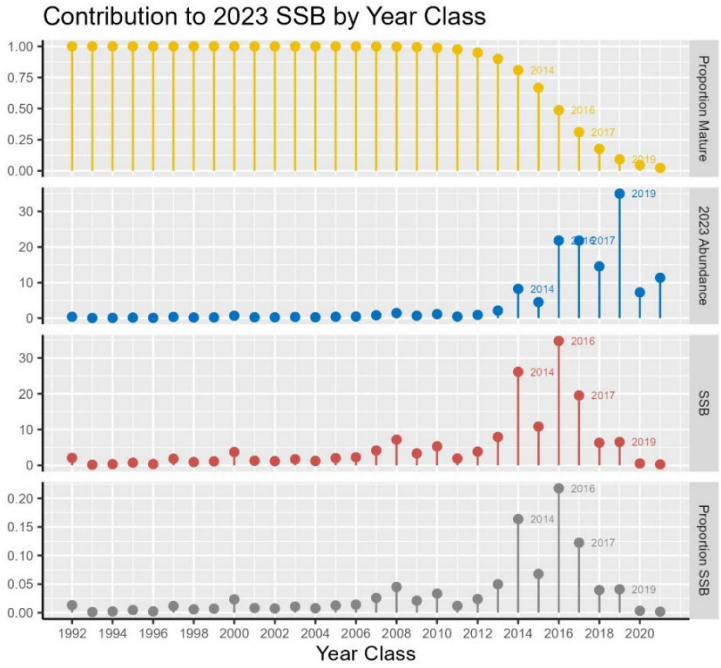


Figure 2 Proportion mature (top panel), projected 2023 female (assuming a 50:50 sex ratio) abundance (millions of fish; second panel from top), projected 2023 spawning stock biomass (kilotons; third panel from top), and proportional contribution to 2023 SSB (bottom panel) for each of the last 30 year classes. Note that the 1992 year class represents all contributions from all earlier year classes (i.e., fish in the plus group age). Abundance of the 2020 and 2021 year classes are based on mean recruitment, because these year classes have not yet been estimated in the 2022 assessment model. Note the disproportionate contribution of recent year classes to sablefish SSB, despite these fish not yet reaching full maturity. Source: Goethel et al. (2022).



Distribution of Recent Year Classes

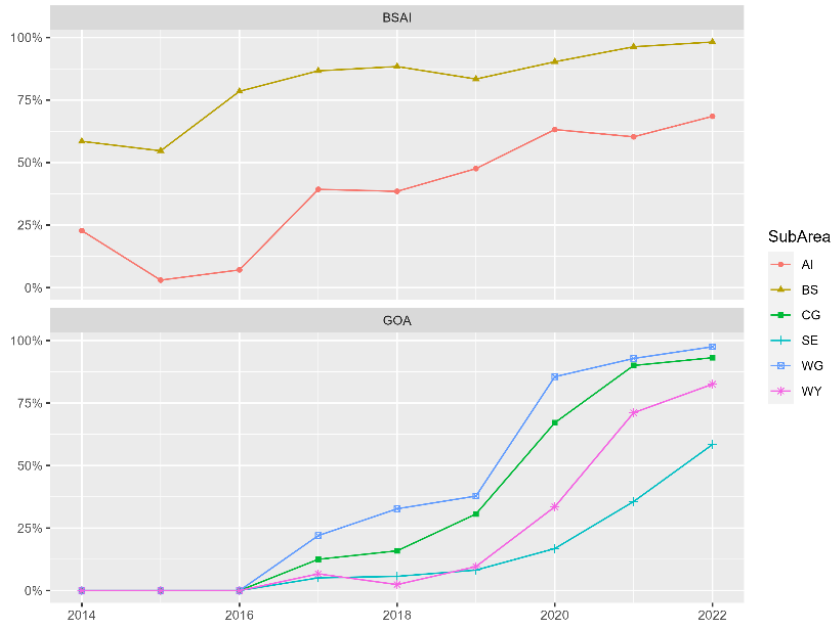
The occurrence of multiple large year classes has affected the relative distribution of sablefish across the Alaska region. The AFSC longline survey relative population numbers (RPN)[5] increased rapidly starting in 2016, with the greatest increases in the BS/AI regions (Goethel et al., 2022). Increases in survey abundance have been largely driven by these rapid increases in young, small sablefish from the 2014 - 2019 year classes. Recent year classes have been observed more prevalently in the western regions of the GOA and BS/AI but are present in high abundance in all regions. Currently, there is limited information to make any definitive assertions as to the movement patterns of these large recent year classes (e.g., whether there is increasing affinity for remaining in the Bering Sea as recent year classes mature).

[5] RPN is a relative index of the number of fish for each sablefish management area. RPN is calculated by extrapolating catch rates from the survey stations to entire management areas.

2.2 Fishery and Market Updates

The sablefish IFQ fishery began in 1995 and for years was primarily a hook and line (H&L) fishery. Due to concerns of increasing whale depredation affecting the fishery, the Council has gradually reduced regulatory restrictions on use of pot gear in the IFQ fishery. The Council allowed use of pot gear for retaining sablefish IFQ in the GOA starting in 2017.[6] Since then, effort in the pot sector has significantly increased, and in 2022, over 80% of all sablefish IFQ was harvested using pot gear (Figure 3). This represents a substantial increase in the use of pot gear since the last review of this action in February 2021, which included data through 2020.

Figure 3 Percentage of IFQ/CDQ sablefish catch by pot gear by FMP and management area. Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA.



Pot sector participants utilize both traditional conical pot configurations as well as the newly introduced slinky pots. This fishery continues to evolve as fishermen are learning to fish a new gear type, experiment with different pot configurations, and explore the use of escape rings. This rapid growth in the use of pot gear represents a major change in a fishery that experienced little change since the IFQ Program was created.

After the start of the IFQ Program, sablefish quotas slowly decreased in response to the large year classes of the late 1970's moving through the population. The sablefish quota reached a low of 11,795 t in 2016. In response to the numerous large year classes occurring since 2014 (Section 2.1), the sablefish ABC and corresponding quota have greatly increased and continue to increase (ABC= 40,502 t in 2023). This represents a 3.5-fold increase from 2016 to 2023. Catch has increased in response to quotas; sablefish IFQ landings in 2022 in Alaska exceeded 42 million lbs (Figure 4). However, the total amount harvested in proportion to ABC is lower in recent years: in 2022, 63% of the total quota was harvested compared to 87% in 2016.

[6] In 1996, the prohibition on sablefish longline pot gear use was removed for the BS, except from June 1 to 30 (61 FR 49076, September 18, 1996). Sablefish longline pot gear was allowed in the AI during this time.

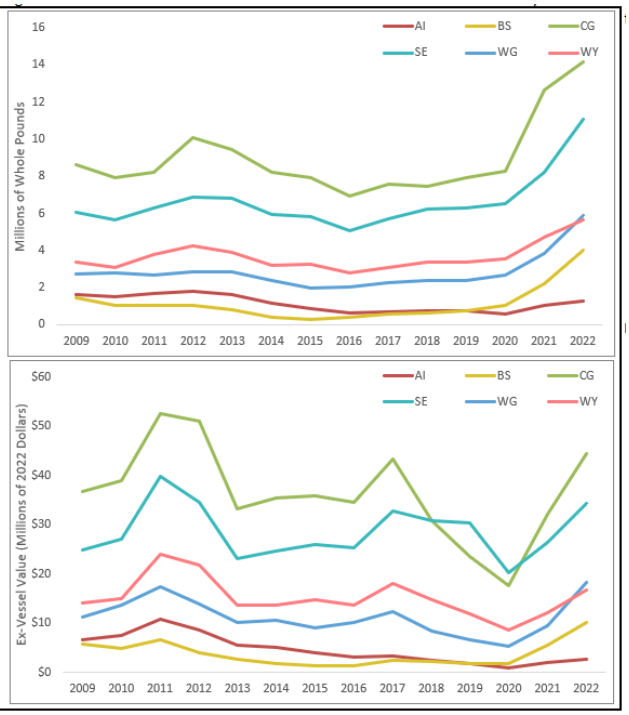
Figure 4 Sablefish IFQ Landings and Ex-Vessel Value by Management Area, 2009-2022. Source: ADFG/CFEC Fish Tickets, data compiled by AKFIN in Comprehensive FT.

LANDINGS

Management Area	AI	BS	CG	SE	WG	WY	Total
2009	1.64	1.46	8.65	6.06	2.71	3.40	23.93
2010	1.52	1.05	7.91	5.65	2.77	3.08	21.98
2011	1.68	1.05	8.21	6.30	2.66	3.81	23.71
2012	1.81	1.05	10.07	6.87	2.85	4.23	26.88
2013	1.60	.80	9.41	6.83	2.85	3.89	25.37
2014	1.18	.43	8.24	5.92	2.42	3.23	21.43
2015	.89	.31	7.92	5.82	1.98	3.27	20.19
2016	.66	.39	6.93	5.08	2.02	2.81	17.89
2017	.69	.60	7.58	5.70	2.25	3.06	19.89
2018	.73	.64	7.47	6.23	2.39	3.36	20.82
2019	.75	.78	7.91	6.28	2.40	3.39	21.52
2020	.60	1.04	8.30	6.50	2.70	3.55	22.69
2021	1.05	2.21	12.62	8.20	3.87	4.75	32.70
2022	1.26	3.99	14.17	11.07	5.88	5.67	42.05

EX-VESSEL VALUE

Management Area	AI	BS	CG	SE	WG	WY	Total
2009	6.73	5.67	36.80	24.78	11.20	14.18	99.37
2010	7.42	4.84	38.95	27.12	13.65	15.03	107.01
2011	10.78	6.57	52.69	39.79	17.44	24.10	151.36
2012	8.70	4.10	51.13	34.58	13.81	21.84	134.15
2013	5.61	2.61	33.28	23.06	10.16	13.56	88.28
2014	4.99	1.75	35.42	24.60	10.55	13.65	90.96
2015	4.05	1.31	35.96	25.94	9.12	14.80	91.19
2016	3.15	1.44	34.63	25.37	10.12	13.74	88.45
2017	3.33	2.39	43.43	32.80	12.25	17.99	112.19
2018	2.41	2.15	30.87	30.88	8.46	14.79	89.57
2019	1.77	1.80	23.65	30.30	6.73	11.89	76.14
2020	.96	1.80	17.60	20.26	5.30	8.66	54.60
2021	2.08	5.51	32.10	26.37	9.38	12.18	87.63
2022	2.72	10.18	44.49	34.40	18.26	16.76	126.81



Catch of sablefish on the trawl fishery increased greatly starting in 2018 (Goethel 2022, Appendix 3D p.140). A large component of this catch was comprised of juvenile sablefish (<2 yrs old) in the eastern Bering Sea region caught incidentally in the pelagic and non-pelagic trawl fisheries. As a result, discard rates increased in the trawl fisheries, namely in the Bering Sea region. As described in Section 3.2.1, these vessels are subject to additional monitoring requirements that do not apply to the sablefish IFQ fishery.

At the time of the February 2021 analysis, price data were available through 2020, and showed declines in sablefish IFQ ex-vessel value since 2017, mainly in the CG, WY, and WG. The bottom panel of Figure 4, which includes data through 2022, indicates an increasing trend over the last few years of the fishery, noting that the Covid-19 pandemic likely influenced ex-vessel value in 2020. Ex-vessel values per trip rebounded in 2022, but vary significantly by FMP subarea (Table 1).

Table 1 Average Ex-vessel value per trip by management area in 2022 dollars. Source: ADFG/CFEC Fish Tickets, data compiled by AKFIN in Comprehensive FT.

Year	AI	BS	CG	SE	WG	WY	All Areas
2010	$79,801	$28,953	$63,857	$49,768	$76,253	$71,891	$59,350
2012	$79,071	$26,112	$79,399	$56,962	$69,052	$93,327	$68,727
2013	$65,182	$21,384	$49,161	$40,748	$50,041	$61,640	$47,107
2014	$65,696	$17,844	$59,128	$46,504	$62,399	$66,916	$54,302
2015	$56,272	$17,031	$61,057	$46,401	$48,536	$65,770	$53,326
2016	$57,246	$19,221	$53,612	$48,135	$51,641	$61,885	$51,395
2017	$59,528	$30,700	$64,334	$54,758	$67,321	$82,503	$62,053
2018	$37,114	$33,136	$39,936	$44,628	$47,262	$58,214	$44,164
2019	$27,685	$23,623	$34,888	$44,038	$43,123	$43,892	$39,390
2020	$22,936	$27,754	$29,001	$26,621	$44,952	$30,402	$29,073
2021	$42,524	$51,450	$52,201	$31,586	$86,882	$40,321	$43,466
2022	$82,566	$80,806	$67,312	$39,770	$119,333	$54,579	$59,121
Total	$58,936	$32,877	$54,223	$43,186	$62,922	$59,260	$50,879

The increasing trend in ex-vessel value in recent years is a direct result of increased total catches, and not increases in prices, which have remained low in recent years across size grades (Table 2/Figure 5). As shown in Figure 6 and Figure 7, the percentage of landed sablefish IFQ in the 1-3lb processor size grade increased starting in 2017, and has continued to increase in the WG and CG. In contrast, the percent of larger sablefish (processor grades 5/7 and 7+) showing up in the catch has consistently declined since 2017. Rapid increases in quotas, coupled with availability of predominantly small sablefish, has resulted in suboptimal economic conditions.

Table 2 Alaska-wide average sablefish processor size grade prices accessed from AKFIN on May 12, 2023 and includes landings data through April 2022. Data were limited to sablefish landed in the IFQ/CDQ management programs by pot and hook-and-line gear. Prices were weighted by catches within FMP subarea, in 2022 dollars. Note that data from 2023 are incomplete and may not be comparable to annual data in previous years.

Year	*Grade 1/2*	*Grade 2/3*	*Grade 3/4*	*Grade 4/5*	*Grade 5/7*	*Grade 7+*
2015	$4.30	$4.46	$5.74	$6.67	$8.21	$9.49
2016	$4.75	$5.18	$6.24	$7.14	$8.82	$10.78
2017	$5.33	$6.28	$7.64	$8.79	$10.04	$11.37
2018	$1.66	$3.09	$4.51	$5.66	$8.89	$9.82
2019	$1.60	$2.43	$3.42	$4.56	$7.46	$8.77
2020	$0.50	$1.53	$2.21	$2.82	$4.41	$6.92
2021	$1.09	$2.30	$2.94	$3.39	$4.49	$6.71
2022	$0.96	$2.02	$2.79	$4.26	$7.03	$8.17
2023	$0.64	$1.29	$1.84	$2.63	$5.49	$6.73

Figure 5 Alaska-wide average sablefish processor size grade prices accessed from AKFIN on May 12, 2023 and includes landings data through April 2023. Data were limited to sablefish landed in the IFQ/CDQ management programs by pot and hook-and-line gear. Prices were weighted by catches within FMP subarea, in 2022 dollars. Note that data from 2023 are incomplete and may not be comparable to annual data in previous years.

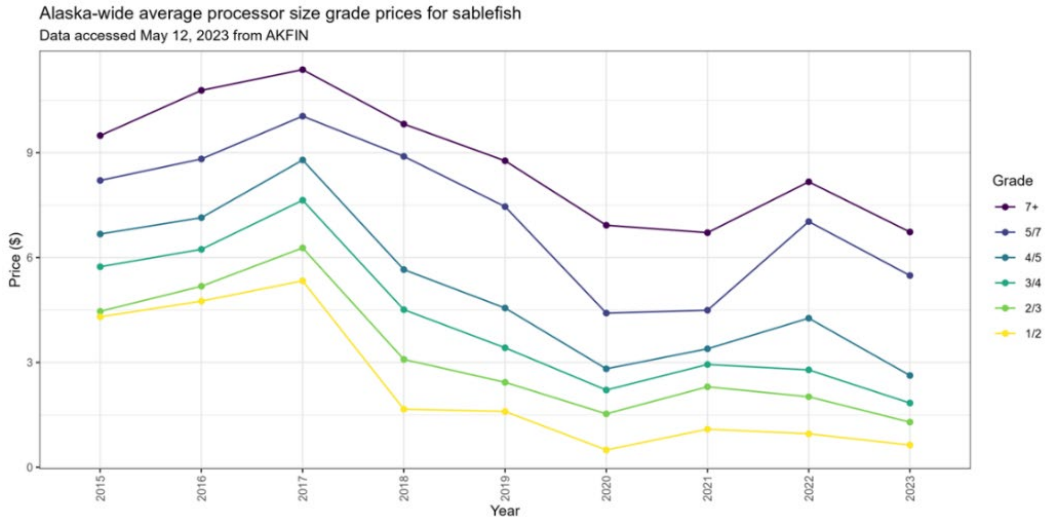


Figure 6 Sablefish processor size grade compositions (percent of landed catch by size grade) by management area. Each panel represents a processor size grade, where '1/2' includes fish less than 2 dressed lb '2/3' includes fish greater than or equal to 2 dressed lb and less than 3 dressed lb, etc. Data accessed from the Alaska Fisheries Information Network (AKFIN) on May 12, 2023 includes landings data through April 2023. Note that data from 2023 are incomplete and may not be comparable to annual data in previous years. Data were limited to sablefish landed in the IFQ/CDQ management programs by pot and hook-and-line gear.

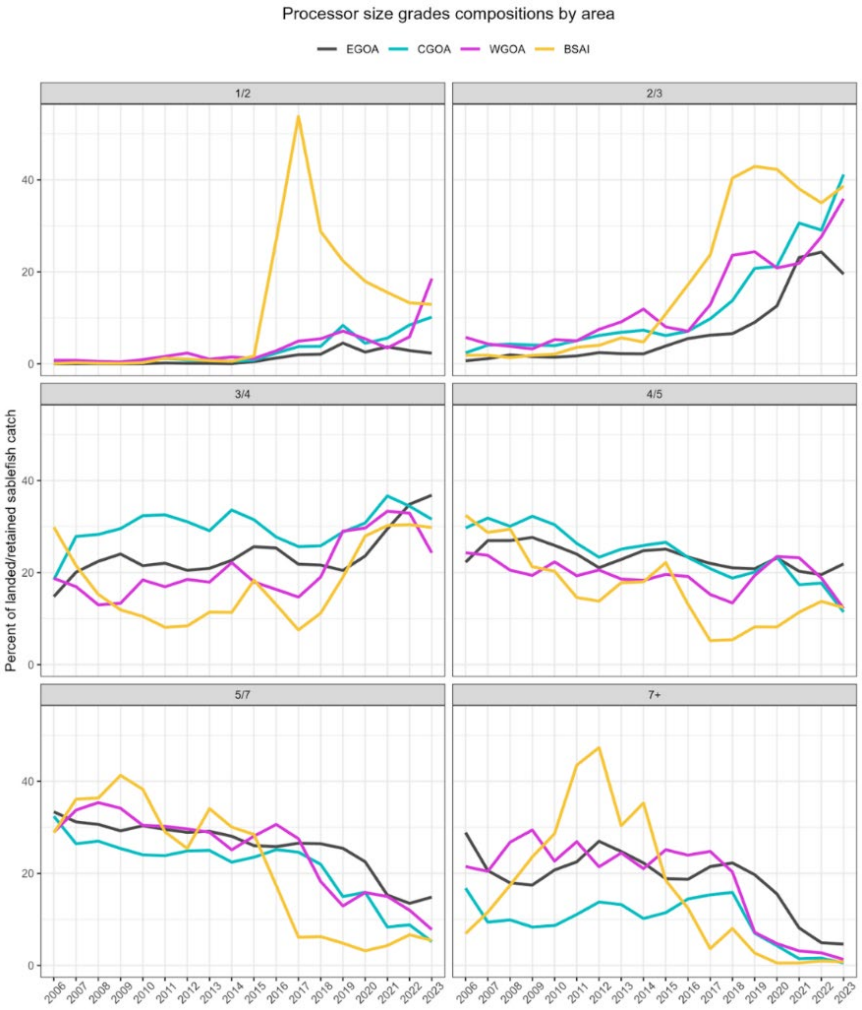
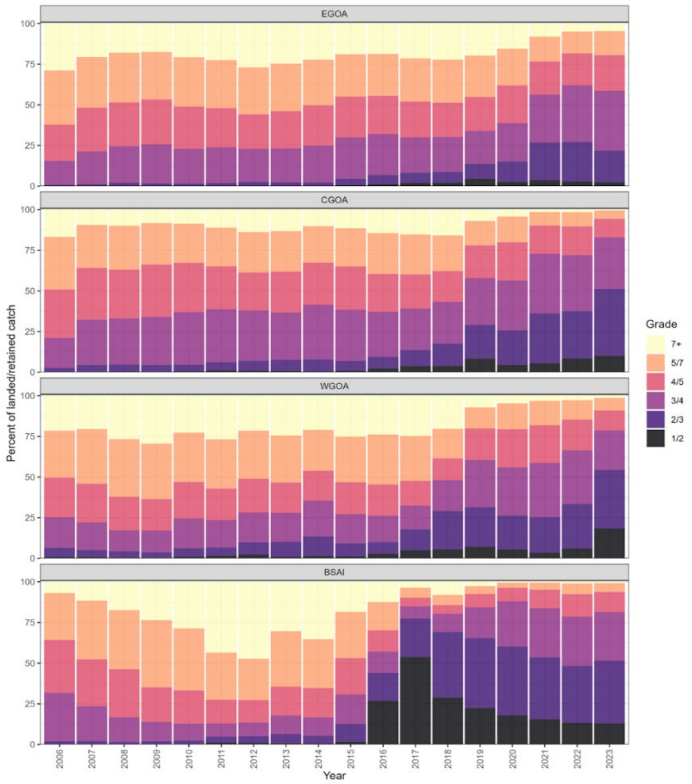


Figure 7 Sablefish processor size grade compositions (percent of landed catch by size grade) by management area. Each panel represents a management area processor size grade. Data accessed from the Alaska Fisheries Information Network (AKFIN) on May 12, 2023 includes landings data through April 2023. Note that data from 2023 are incomplete and may not be comparable to complete annual data in previous years. Data were limited to sablefish landed in the IFQ/CDQ management programs by pot and hook-and-line gear.



3 Considerations for Future Analysis

3.1 Yield Per Recruit Analyses and Knuckey Analysis Considerations

Some Council members and stakeholders have expressed interest in consideration of the study conducted by Dr. Ian Knuckey in 2021 (Knuckey 2021). This section compares the original yield per recruit (YPR) analysis from the 2021 initial review document and Knuckey 2021. The YPR analysis was based on the assumption that a small sablefish was defined as less than or equal to 3 lbs (dressed weight). This is equivalent to a 4.76 lb fish in whole pounds assuming a product recovery rate of 0.63.[7] At this weight, sablefish are approximately 58 cm (22.8 in) fork length (measured from nose to fork), or 24 inches total length. At a processor, this would be a grade 2/3 fish. Appendix 1 includes size/age conversions. The analysis evaluated the impacts of discarding 3 lbs dressed weight sablefish on stock status and fishery performance under three retention selectivity scenarios: Full retention, knife-edged, logistic, and exponential. Results were reported for a range of DMRs bookended between 5% and 100% (see Section 2.2.3.4 in the 2021 analysis).

[7] Current product recovery rates are specified in the Code of Federal Regulations, Table 3 to Part 679 - Product Recovery Rates for Groundfish Species and Conversion Rates for Pacific Halibut. NPFMC 2021 assumed the Eastern cut product recovery rate of 0.63.

In contrast, Knuckey (2021) used 3 *whole* lbs (round lbs), which translates to a 1.9 lb fish in dressed weight (grade 2/3, 50 cm fork length, 21 in total length). The Knuckey analysis functionally assumed a minimum size limit by assuming knife-edge selectivity, meaning that all fish less than or equal to 3 whole lbs would be discarded and all fish greater than 3 whole lbs would be retained. (See NPFMC 2021, Table 2-10 or Figure 2-6 for descriptions of theoretical retention selectivities.) The Knuckey (2021) analysis assumed a DMR of 11.7%.

The different definitions of "small sablefish" in Knuckey (2021) and NPFMC 2021 highlight the need for clarification on what sizes of fish constitute a "small" sablefish for any future analysis. Generally speaking, both Knuckey (2021) and NPFMC 2021 found that under a low DMR and minimum size limit assumption, there was a small increase in yield and fishery value under long-term average conditions. However, under more conservative retention scenarios (e.g., the price-driven retention selectivity in NPFMC 2021, which represents the upper bound of potential discarding behavior), yield, fishery value, and fishery efficiency decreased, and this was exacerbated when the DMR was higher (see Section 3.3 for a discussion of DMR considerations). Without a regulatory minimum size limit in place, it is unrealistic to assume knife-edge selectivity in the fishery. Therefore, any analysis using knife-edge selectivity should be interpreted with caution.

The follow up analysis by Koopman and Knuckey (2022) was also reviewed for this update; however, the YPR results were not consistent with the 2021 staff analysis. Specifically, Koopman and Knuckey (2022) found that discarding at a higher retention length (again, equivalent to a higher minimum size limit) would increase yield given the same level of fishing mortality (see Figure 4 in Koopman and Knuckey 2022). However, NPFMC 2021 demonstrated that fishing mortality would need to be increased to maintain the same yield under a high discard scenario. In other words, the fleet would need to fish harder in order to catch (and retain) the same amount of fish. Further comparison of the methods between the 2021 analysis and Koopman and Knuckey (2022) regarding how discards were accounted for in the fishing mortality equation are needed to compare and interpret the results.

3.2 Monitoring Considerations for Estimating Discards

3.2.1 Ensuring accurate catch accounting in Council-managed fisheries

When fishing under the IFQ Program began in 1995, it was one of the first rationalized fisheries off Alaska. One of the ten problems and issues the IFQ Program was designed to address was fishing mortality due to discards and bycatch. The Council and NMFS thought that because fishermen would have an incentive to minimize their costs and would be required to retain legal size halibut and all sablefish that this would reduce discard mortality in the fishery. The fishery monitoring and enforcement provisions for the IFQ Program were designed to minimize waste and discards as well as underreporting of catches. To reduce waste and to increase the accounting of catch, the Council recommended, and NMFS implemented retention requirements for persons harvesting halibut and sablefish under the IFQ and CDQ Programs. The prohibition on discarding sablefish IFQ, along with other enforcement provisions, allows for accurate catch accounting and appropriate debiting of IFQ accounts as well as acting as a deterrent for highgrading.

Since 1995, many changes and improvements have occurred in the design and implementation of the monitoring programs off Alaska. With the development of each catch share program, the Council and NMFS have implemented the monitoring tools necessary to monitor and enforce each program. Because full retention of sablefish is a fundamental design provision of the IFQ Program, monitoring and enforcement would need to be modified for accurate catch accounting and to collect fishery information necessary to estimate sablefish mortality of discards. These changes would be necessary for the conservation and management of the sablefish stock consistent with National Standard 1. This would also

represent a shift away from the largely enforcement-based program toward a more monitoring-based program which would be more similar to other limited access privilege programs (LAPPs) off Alaska.

Other LAPPs in which sablefish discarding occurs, such as the Amendment 80 and American Fisheries Act (AFA) Programs, were developed with specific monitoring requirements built into their design to estimate and account for discards. For example, vessels in these fisheries have 100-200% monitoring at-sea, and catcher-processors also carry in-line scales and have EM systems for additional compliance monitoring. Other programs where sablefish discarding is authorized include the West Coast IFQ Program, which has a dockside catch monitoring program with a port sampling component to allow for collection of biological data, and the halibut IFQ Program, for which the IPHC has a port sampling program. Note that dockside biological data collection - including size - requires that fish are delivered whole, bled, or gutted (the least preferable).

Upon implementation of the IFQ Program, the potential for underreporting of IFQ harvests and highgrading were often cited as biologically detrimental aspects of IFQ-style management programs. Underreporting and highgrading are discussed in detail in the FEIS prepared for the IFQ Program at Appendix E (pp. 2-7) (NMFS 1992). At the time, NOAA recognized that underreporting would not be completely prevented, but a planned increased enforcement and monitoring effort coupled with severe penalties for gross underreporting was expected to minimize this potential source of biological damage to the stocks. Highgrading, the substitution of large high-valued fish for harvested small low-valued fish, was not expected to be a major threat because of increased enforcement and because at the time, there was a relatively small market price difference between small and large fish which reduced the profitability of highgrading and, therefore, the incentive to discard harvested fish.

3.2.2 Estimating Discards in the Sablefish IFQ Program

In Alaska, the NMFS Catch Accounting System (CAS) generates total groundfish catch estimates (retained and discarded). Accurate estimates are needed for inseason management and for assessment purposes. The majority of discard estimates in the CAS are derived from observer data. Observer data from the sablefish IFQ fishery are limited. In 2022, over 90% of vessels in the sablefish IFQ fishery were in the partial coverage category of the North Pacific Observer Program. In 2022, 4% of fixed gear trips that landed sablefish IFQ were in the no-selection pool, 12% were monitored by an at-sea observer, and 5% were monitored by EM (personal communication, P. Ganz 2023). It is worth noting that in 2022, the realized coverage rates for fixed gear EM (both H&L and pot) vessels and observed H&L vessels were lower than the target rates expected (AFSC and AKRO 2023). The selection rates specified in the 2023 Annual Deployment Plan (for partial coverage fisheries in 2023) are provided in Table 3. In 2023, catcher vessels over 40 ft using H&L or pot gear have target selection rates of 18% and 17%, respectively (NMFS 2022) (note this is for all fixed gear, not specifically vessels targeting sablefish IFQ). Additionally, 179 fixed gear vessels are currently in the EM pool. Instead of potentially being selected to carry an at-sea observer, fixed gear vessels in the EM pool have a 30% chance of being selected to turn on their EM systems and have video reviewed. Data from trips monitored using EM are used to estimate the number of fish discarded, but current methodologies do not provide information regarding the size of fish released. Therefore, discard weights calculated by the CAS get extrapolated using observer-based estimates of average weight per fish (of unsorted catch).

Table 3 Summary of total trips, allocation weights, selection rates, and the number of trips expected to be observed in each sampling strata in 2023. Source: NMFS 2022.

Component	Pool	Stratum	Total Number of Expected Trips	Allocation Weight	Selection Rate (%)	Number of Trips Expected to be Observed
Partial Coverage	**Observer Trip Selection**	Hook-and-line	1,253	0.31	17.87	224
		Pot	1,163	0.07	17.09	199
		Trawl	805	0.63	22.68	183
		Total	**3,221**	**1.00**	**18.79**	**606**
	Fixed-Gear EM trip selection	EM Hook-and-line	**669**		30.00	201
		EM Pot	**408**		30.00	122
		Total	**1,077**		30.00	**323**
	Trawl EM Trip Selection	Trawl EM (GOA)	482		33.33*	161
		Total	**482**		**33.33**	**161**

At sea observers are currently able to capture the number of fish and size distribution of unsorted sablefish catch, but would not be able to capture the size distributions of (retained and) discarded fish separately without significant alterations to observer sampling protocols, and at the cost of other data collections. These alterations would require major changes to observer databases to estimate size-selective discards, which would take time and resources away from other monitoring priorities.

Previous discussion papers and NPFMC 2021 explained the challenges associated with changing at-sea observer sampling methodology to effectively estimate discards if release of small sablefish were authorized, including the potential bias introduced when discarding is optional (a voluntary discard scenario). The 2021 analysis provided alternative processes for estimating discard amounts but numerous complications arise, especially when discarding is voluntary (no minimum size limit). To estimate discards under a voluntary release scenario, at sea observers would need to adopt an effective sampling methodology to estimate the number and size of fish released at the rail/on deck, and these estimates would need to be extrapolated to EM and unobserved trips.

Currently, sablefish discards in the sablefish IFQ fleet are mainly limited to drop-offs and overages, therefore, under the current data collection and estimation model, fishery managers assume that the weight distribution of discarded sablefish is similar to the weight distribution of retained sablefish. This assumption, that the size distribution of what is sampled (unsorted catch) is representative of total fishery removals, enables estimation of the size distribution and amount of total fishery removals. If fishermen are allowed to discard sablefish without a minimum size limit, managers would have to reevaluate the use of assumptions about the size at which sablefish are discarded, since the relationship between size and retention would be unknown. Discarded or retained catch would not be estimable from observer data when retention is dependent on the size of the fish. Managers would need discard size data, which are currently not collected, in order to estimate discards (and thus total removals) with the same level of accuracy and precision with which they are currently estimated.

The discard estimation method proposed in NPFMC 2021 would estimate discards as the difference between estimates of total catch (based on the CAS and monitoring data) and retained catch reported in landings data. This method relies only on data currently collected and would therefore increase the uncertainty in sablefish catch estimates, relative to what it is now.

Instituting a minimum size limit would alleviate some of the challenges associated with estimating discards but would still require a proxy method to account for the total number and size of fish discarded. Alternative monitoring options (such as port sampling, which would provide size distribution of retained fish separate from total catch- see NPFMC 2021, Section 2.2.4) may provide adequate approaches for helping address the issue of accurately capturing size and number of fish discarded at sea but have not been evaluated fully in previous analyses, in part due to the budget and resources needed to develop such a program. This would also not replace any at-sea monitoring.

3.3 Discard Mortality Rate (DMR) Considerations

In addition to estimates of numbers and sizes of sablefish discards, mortality associated with discards would also need to be estimated in order to estimate total sablefish removals. Previous papers outlined the DMR process and discussed steps that the Council could initiate to begin developing DMRs specific for the sablefish IFQ fishery. To date, no scientific studies have been conducted to estimate a DMR specific to the Alaska sablefish IFQ fishery. For the 2021 analysis, the Council directed analysts to consider four proxy DMR options for evaluation (5%, 12%, 16%, 20%). These values roughly correspond to existing proxy DMRs determined through research studies (Stachura et. al 2012, Somers et al. 2020) or used by other agencies in sablefish management. Appendix 2 provides sablefish discarding requirements and related DMRs, size limits, and monitoring requirements used in other regions or by other agencies. Numerous factors affect survival following release including gear type and soak times, depth of capture, handling practices, hooking injury, or unknown mortality following release due to long-term injury or predation. Additionally, with the rapid increase in pot gear catch in the sablefish IFQ fishery since the last analysis, it is likely a DMR estimate for both pot gear and hook and line gear should be investigated.

While the Council may select a recommendation for preferred DMRs, a(n) Alaska IFQ-specific DMR(s) would need to be determined through a scientific process including thorough review by the Council's scientific review bodies (Groundfish Plan Teams, SSC). This determination could be made through evaluation of results of any existing scientific studies along with consideration of what other agencies currently use. No studies are currently underway, therefore a scientifically vetted DMR based on the IFQ fleet is unlikely to be available in the near future.

It is important to note that none of the DMRs proposed under Element 1 of Alternative 2 account for post-release depredation by whales. As mentioned in Section 2.2, the sablefish IFQ fishery has exhibited a significant change in gear types over recent years, in response to increased whale depredation. If sablefish discards in the IFQ fleet were authorized in the future and occurred in the presence of whales, the potential for depredation on discarded fish exists and ideally would be accounted for in DMR estimates. It is possible that a DMR that accounts for whale depredation would be higher than any of the options proposed under Element 1.

3.4 Stock Assessment Considerations and Effects on Uncertainty

This section identifies main concerns related to assessment uncertainty/complexity and what would be required to address the SSC's remaining recommendations for analysis identified in Section 1.1.

The sablefish stock assessment model uses both fishery independent (surveys) and fishery dependent (logbooks, observers, EM) data. The assessment relies on fishery dependent data to inform the assessment model on total removals from the population through fishing activities and to track incoming year classes to inform the age-structured model. This information is gathered through observer and EM catch sampling along with collection of biological data including lengths, weights, and otoliths for ageing. Catch and associated discard estimates of monitored trips are recorded by observers and EM and extrapolated to unobserved trips. The amount of uncertainty, or error, associated in these estimates is not reported, but the data are collected using unbiased statistical sampling protocols. Catch estimates and

discards are typically derived at the CAS level and not as part of the stock assessment process. Biological data (length/weight/age) are collected by observers and provided to the stock assessment authors for use in the model. The sablefish assessment model is a fairly complex model as it is sex-specific and tracks a population that experiences sporadic and variable recruitment events across multiple large marine ecosystems in Alaska. Additionally, the recent shift from hook-and-line to pot gear in the fixed gear fishery as a result of whale depredation and changes in pot gear design have generated an additional layer of complexity in the stock assessment. These complexities overall help to better understand the dynamics of the fishery and population, but also result in an assessment that requires sufficient data to inform the model. Well-informed models are necessary to accurately estimate the size of the sablefish stock and to set future catch levels to achieve optimum yield.

Optional release of sablefish creates several concerns at the stock assessment level. First, based on existing levels of at sea observer monitoring of the IFQ fleet, data from the limited number of trips observed may not be sufficient to provide an accurate estimate of discards in the fishery. Because these estimates are then extrapolated to unobserved trips, and error is not currently calculated for catch or discard estimates, quantifying the uncertainty generated from this action as it is propagated through the assessment is difficult.

Second, accurate accounting of the size of fish discarded is required to inform the assessment model on the age structure of the population being caught. Not having accurate estimates of the size distribution of the fish discarded would affect model performance and the ability to track age structure of the population. Introducing uncertainty in the catch and mortality of small fish may result in poor model performance when estimating the occurrence and size of incoming year classes from fishery data. A voluntary release regulation would make estimating the retention curve, or the fish retained in the fishery, challenging without accurate monitoring. Alternative data sources, such as the longline survey, are also used to infer information about the population. However, if the fishery data are not representative of the population, conflicting trends among data sources will further increase uncertainty that cannot easily be quantified. The overall effects on the assessment model could be mitigated if only small fish that do not comprise a large proportion of the population (and are therefore not commonly caught) are the ones being discarded.

Quantifying uncertainty in a stock assessment model is challenging. The quality of the data informing the model is fundamental to performance. Accurate accounting of the number and size of fish discarded is essential (See Section 3.2). Many other fisheries mitigate some of this concern by instituting minimum size limits (see Appendix 2), which may not help estimate the numbers of fish discarded but can provide information on size. Application of a DMR to the discards further introduces uncertainty because it is challenging to set an accurate mortality rate for discarded fish (See Section 3.3). Considerable effort will be needed to reconfigure the stock assessment model to account for discards with no previous data or time series to help guide decisions. Additionally, extensive simulation testing applying different hypothetical assumptions will be required to better understand and quantify the effects as evidenced by previous SSC recommendations.

External to the monitoring and estimation concerns surrounding discarding, the results of this action would shift fishing effort to the larger, older segment of the sablefish population. The current NPFMC harvest control rules (HCR) consider all mature fish as part of the exploitable biomass. Even if only a small fraction of small fish are considered mature, these fish are included in the calculations that determine ABC. The sablefish population has experienced large, sporadic recruitment events over time and the current age structure consists of many partially mature small fish and fewer fully mature old fish. Shifting even a portion of the overall fishing effort to the older population will likely require reductions in ABC to ensure this segment of the population is not overharvested.

The current Council process does not provide an avenue for easily acknowledging this concern nor addressing ABC in this context other than recommending a reduction in ABC through the use of risk

tables. In response to these recent sablefish recruitments and changes in population structure, research has been initiated to better evaluate the performance of the NPFMC HCRs under these scenarios. Depending on the magnitude and effect this action may have, additional work on the HCRs and subsequent ABC recommendations should be considered.

4 Additional Workload Considerations and Tradeoffs

Transitioning from a full retention fishery to a fishery which allows discarding requires accounting of discards at-sea. To reduce the uncertainty introduced from at-sea discards, many fisheries have adopted minimum size limits, thus creating what is known as a "knife-edge selectivity curve" for the fishery. A voluntary discard option will require at-sea monitoring to develop a retention selectivity curve based on the number and size of fish discarded, i.e., the fish that are retained versus discarded at-sea. The ability to estimate a retention selectivity curve is based on monitoring capabilities. Currently, only at-sea observers have the ability to monitor both the number and the size of discards. If release of small sablefish becomes voluntary (no minimum size limit), observer sampling methods would need to be altered to estimate the average weight of discarded sablefish separately from that of retained sablefish. This requirement will add to the workload of at-sea observers and other data collections would need to be reduced to accommodate these additions. If the Council prioritizes expansion of EM, (the Council and NMFS have recommended expanding the EM pool up to 200 vessels as funds are available), this could result in further loss of biological and length data if no other monitoring system is put in place, particularly if there is no minimum size limit. Loss of haul level information and biological samples, inclusive of length and weight data, is already an existing concern for stock assessments with the replacement of at-sea observers by EM system.

The mortality associated with discarding can be estimated by multiplying a discard mortality rate by the number of discarded fish. A DMR would need to be scientifically established for this action, as no existing studies have developed DMRs for the Alaska IFQ fixed gear fishery. NPFMC 2021 addressed the uncertainty in stock assessment based on different scenarios of discarding and monitoring (Table 4).

Table 4 Increasing stock assessment uncertainty under a range of discarding and monitoring scenarios, including mandatory full retention (status quo) and voluntary discards with at-sea observers. Results are presented in terms of the stock assessment's capability to estimate gear selectivity, retention selectivity, and discard mortality rate (DMR), where green means variables can be estimated, red means they cannot be estimated, and yellow means they can be estimated with some increased uncertainty.

Increasing stock assessment uncertainty ↓

Scenarios	Data used in stock assessment	Ability to estimate:			Example
		Gear selectivity	*Retention selectivity*	*Discard mortality rate (DMR)*	
Mandatory retention with at-sea observers	Age or length compositions from the total catch	Yes	*Not needed*	*Not needed*	Status quo
Voluntary discarding with at-sea observers paired with shoreside sampling	Age or length compositions from the retained catch *and* the total catch (retained + discarded)	Yes	Yes	No	BSAI king, snow, and tanner crabs
Minimum size limit with at-sea observers	Age or length compositions from the total catch (retained + discarded)	Yes	Assume full retention at minimum size limit	No	--
Voluntary discards with at-sea observers only	Age or length compositions from the total catch (retained and discarded)	Yes (but may increase uncertainty)	No	No	--
Voluntary discards with shoreside sampling only	Age or length compositions from the retained catch	No	No	No	Chatham Strait sablefish

Furthermore, as described in Section 2.1, the fishery and the survey both indicate that a high proportion of the population is made up of small fish. While allowing discards of small fish may provide an opportunity for harvesters to retain larger fish, the data illustrate that there are not a lot of large fish in the population at this time. A primary uncertainty related to fishery operations that would be difficult to quantify within a simple analysis (i.e., YPR or SPR) is the degree to which effort is redistributed from small to large fish. For instance, from a biological perspective, redirecting effort among recent year classes (e.g., from 2018 to 2016 year classes), would likely have limited biological consequence. Conversely, a more drastic redistribution from recent year classes to large, fully mature fish could be detrimental, given the relatively reduced number of large spawners in the population. In terms of prioritization, it is important to weigh the level of resources and time required for additional analysis that would be needed (particularly from AFSC) with the likelihood of expected benefits of this action.

Allowing discards in the IFQ fishery will create in-season mortality not associated with landings that currently does not exist because of the requirement for full retention. IFQs are issued to individuals before the start of the season. Management needs to identify a way to decrement the ABC/TAC at some point in the specifications process to ensure the mortality associated with discarding is accounted for. Allowing small fish to be discarded will shift fishery effort to larger, older fish in the population. The current stock assessment and Council harvest control rules do not account for this: ABC is based on harvesting B40% of the proportion of mature fish in the population. Shifting effort to a specific segment of the population will require adjustments in ABC to account for increased harvest on the older, larger fish in the population.

Primary uncertainties that would need to be addressed to support future analysis of the action include:

- DMRs are needed to estimate mortality associated with releasing fish. Scientifically accepted DMRs for the Alaska IFQ fixed gear pot and hook and line fleets would need to be established.
- Determining what sizes of fish would be discarded under a voluntary discarding program, or adoption of a minimum size limit.
- Accurate accounting of the number of fish discarded is necessary. Methodologies to estimate the number of fish discarded at the rail (H&L) and on deck (pot) based on data collected by at-sea observers or EM would need to be established and included in standard sampling protocols.
- If optional release of any size fish is adopted, accurate accounting of the size of fish discarded is necessary. Methodologies for at sea observers to estimate size of fish discarded would need to be established and included in standard observer sampling protocols. Note, current EM technology is not able to estimate the size of fish.
- Estimates of discards at-sea need to be generated. The existing CAS system would need to be adapted to extrapolate the at-sea observer data estimates of the number and size of fish discarded to the pot and H&L IFQ fixed gear fleet.
- Estimates of mortality associated with discards need to be generated. DMRs must be applied to the estimated discards by the CAS and/or through the stock assessment process.
- Mortality associated with discards from the IFQ fixed gear fishery would need to be accounted for prior to or during in-season management (e.g., on the West Coast, discards are deducted from the quota). Specifically, accounting for unobserved discards would be needed. IFQs are issued pre-season and there is currently no mechanism to deduct mortality associated with discards from the sablefish ABC/TAC in-season.
- An evaluation of the Council's harvest control rules in relation to sablefish ABC is necessary since this action would shift targeted effort to the larger, older portion of the population rather than the currently assumed total proportion mature implied by the B40% control rule. There is currently no model for calculating ABC under a discard program in the North Pacific.

Lastly, a future analysis would need to address remaining SSC comments and include updated data since 2021.

5 Council Action

Over the past few years, the Council has had to transition to a process whereby both the Council and Agency have limited resources. Difficult prioritization decisions are being made within this climate of limited staff and budgetary restraints. Staff have attempted to lay out potential avenues for action and the associated level of resources that may need to be redirected to this action, under certain scenarios. Currently, there are three general directions of action the Council could take.

1. **Direct staff to stop working on this potential management action.** As described in NPFMC 2021, this would perpetuate the effects of the sablefish discarding prohibition on the fishery, including costs to harvest operations for having to bring lower value fish to the dock. Effects are higher when large year classes result in influxes of small fish into the population. AFSC staff would continue working on previously identified Council priorities for the sablefish assessment, as described in Section 3.4.
2. **Redirect Alternative 2 to require discarding of sablefish smaller than a minimum size limit, which would need to be specified.** This would alleviate some of the challenges posed by not knowing the size of discarded fish (retention selectivity), and limit changes to the monitoring requirements for the IFQ Program, although additional dockside and/or port sampling would likely still be needed to provide size distribution of retained fish separate from total catch. A minimum size limit would provide less flexibility for harvesters to select for more valuable sizes of fish, potentially reducing economic benefits to be gained through the action. However, a minimum size limit would mitigate one large source of uncertainty that is otherwise created by a voluntary discard program, which could reduce the degree to which ABC is influenced compared to under a voluntary discard program. While reconfiguring the sablefish assessment to account for discards would still be necessary, the level of uncertainty would be less than under the voluntary release scenario.
3. **Proceed with the current action, to evaluate a voluntary release option, and direct staff to bring back a second initial review analysis.** The SSC requests and decision points highlighted in this paper will require considerable Agency staff resources to identify and analyze, and considerable Council agenda time to provide direction on each point. For example, in order to appropriately analyze direct and indirect impacts of the action, the Council would need to determine how discards should be accounted for, and how to or whether to identify monitoring provisions (which would be diverted from other priorities) to accurately account for discards within the IFQ Program.

   Under another initial review, the Council could direct staff to:

   i. Proceed with another initial review addressing the SSC's remaining assessment-related questions listed in Section 1.1 and detailed in the SSC's February 2021 recommendations. For the reasons described in Section 3.4, this would involve redirecting staff resources away from other stock-assessment related work that the Council has prioritized. The sablefish stock assessment is completed annually and staff time in the summer/fall is dedicated to providing this advice. A simplified spawner recruit analysis (SPR) simulation analysis based on projections as requested by the SSC can likely be completed in several months outside of the normal stock assessment cycle. More detailed analyses including evaluation of the effects of shifting effort to the larger, older part of the population, how episodic recruitment affects the population, quantifying uncertainty, and how to evaluate monitoring of discards, would likely require a management strategy evaluation (MSE) framework. This effort would require substantially more time and resources, likely several years.

ii. Proceed with another initial review using discretion to address less resource-intensive SSC recommendations.

iii. Proceed with another initial review analysis without planning changes to monitoring protocols. The Council could request the Fishery Monitoring Advisory Committee (FMAC) and AFSC Fisheries Monitoring and Analysis (FMA) Division evaluate the current deployment plan and expected discard estimates. This approach would accept the uncertainty and risk that would occur within the stock assessment without backfilling the anticipated data loss from unmonitored discards.

iv. Begin planning for a scenario where monitoring resources would be diverted from other priorities (e.g., collecting lengths and otoliths from sablefish and rockfish, and collecting halibut lengths and injury assessments) in order to more accurately estimate discards/retention selectivity and minimize the uncertainty in catch accounting and the assessment that would be introduced through allowing sablefish discards.

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Appendix 1 Sablefish size/age conversions

For background the following metrics are provided to understand size and weight of sablefish at age.

Sex	Age	Proportion Females Mature	Fork length (cm)	Total length (cm)	Fork length (in)	Total length (in)	Round weight (kg)	Dressed weight (kg)	Round weight (lb)	Dressed weight (lb)	Grade
Male	1	--	42.6	46.5	16.8	18.3	0.7	0.4	1.5	1.0	Grade 1/2
Male	2	--	47.8	51.6	18.8	20.3	1.1	0.7	2.4	1.5	Grade 1/2
Male	3	--	52.0	55.5	20.5	21.9	1.5	0.9	3.2	2.0	Grade 2/3
Male	4	--	55.2	58.7	21.7	23.1	1.8	1.1	3.9	2.5	Grade 2/3
Male	5	--	57.8	61.2	22.8	24.1	2.1	1.3	4.6	2.9	Grade 2/3
Male	6	--	59.9	63.2	23.6	24.9	2.3	1.5	5.1	3.2	Grade 3/4
Male	7	--	61.5	64.8	24.2	25.5	2.5	1.6	5.5	3.5	Grade 3/4
Male	8	--	62.9	66.1	24.7	26.0	2.7	1.7	5.9	3.7	Grade 3/4
Male	9	--	63.9	67.1	25.2	26.4	2.8	1.8	6.2	3.9	Grade 3/4
Male	10	--	64.7	67.9	25.5	26.7	2.9	1.8	6.4	4.0	Grade 4/5
Male	11	--	65.4	68.5	25.7	27.0	3.0	1.9	6.5	4.1	Grade 4/5
Male	12	--	65.9	69.0	25.9	27.2	3.0	1.9	6.7	4.2	Grade 4/5
Male	13	--	66.3	69.4	26.1	27.3	3.1	1.9	6.8	4.3	Grade 4/5
Male	14	--	66.6	69.8	26.2	27.5	3.1	2.0	6.8	4.3	Grade 4/5
Male	15	--	66.9	70.0	26.3	27.6	3.1	2.0	6.9	4.4	Grade 4/5
Female	1	0.01	42.0	45.9	16.5	18.1	0.7	0.4	1.5	1.0	Grade 1/2
Female	2	0.02	48.1	51.8	18.9	20.4	1.1	0.7	2.4	1.5	Grade 1/2
Female	3	0.05	53.3	56.8	21.0	22.4	1.5	1.0	3.3	2.1	Grade 2/3
Female	4	0.10	57.6	61.1	22.7	24.0	2.0	1.2	4.3	2.7	Grade 2/3
Female	5	0.18	61.3	64.6	24.1	25.4	2.4	1.5	5.3	3.3	Grade 3/4
Female	6	0.32	64.4	67.6	25.4	26.6	2.8	1.8	6.2	3.9	Grade 3/4
Female	7	0.49	67.1	70.2	26.4	27.6	3.2	2.0	7.0	4.4	Grade 4/5
Female	8	0.67	69.3	72.3	27.3	28.5	3.5	2.2	7.8	4.9	Grade 4/5
Female	9	0.81	71.1	74.1	28.0	29.2	3.8	2.4	8.5	5.3	Grade 5/7
Female	10	0.90	72.7	75.6	28.6	29.8	4.1	2.6	9.1	5.7	Grade 5/7
Female	11	0.95	74.0	76.9	29.1	30.3	4.4	2.8	9.6	6.1	Grade 5/7
Female	12	0.97	75.2	78.0	29.6	30.7	4.6	2.9	10.1	6.4	Grade 5/7
Female	13	0.99	76.1	78.9	30.0	31.1	4.8	3.0	10.5	6.6	Grade 5/7
Female	14	0.99	76.9	79.7	30.3	31.4	4.9	3.1	10.9	6.9	Grade 5/7
Female	15	1.00	77.6	80.3	30.5	31.6	5.1	3.2	11.2	7.0	Grade 7+

Below are the formulas used to convert ages to lengths or weights, lengths to weights, round weight to dressed weight (Eastern cut), and fork length to total length. Values are sources from the 2022 stock assessment, except for the fork length to total length formula, which was estimated using data collected during the 2021 Longline Survey (personal communication, K. Echave, AFSC, May 2023).

Conversion	**Formula**
Female age to fork length (cm)	$Length_{age} = 81.2(1 - \exp(-0.17(age + 3.28)))$
Male age to fork length (cm)	$Length_{age} = 67.9(1 - \exp(-0.23(age + 3.3)))$
Female age to round weight (kg)	$\ln(Weight_{age}) = \ln(5.87) + 3.02 \ln(1 - \exp(-0.17(age + 2.98))$
Male age to round weight (kg)	$\ln(Weight_{age}) = \ln(3.22) + 3.02 \ln(1 - \exp(-0.27(age + 2.41))$
Fork length (cm) to round weight (cm) (sexes combined)	$Weight = 0.00001125 Length^{2.99}$
Round weight to dressed weight (Eastern cut) (sexes combined)	$DressedWeight = 0.63 * RoundWeight$
Fork length (cm) to total length (cm) (sexes combined)	$TotalLength = 5.24 + 0.97 * ForkLength$

Appendix 2 Requirements applicable to sablefish discarding in other regions/fisheries

Region	Management program	Gear type	Regulations related to discarding (e.g., size limits, escape rings, application to quota)	At-sea monitoring	Port sampling
Alaska (federal waters)	Individual Fishing Quota	Hook-and-line	Mandatory full retention, no size limit, no discarding allowed	Mix of zero coverage (<40 foot vessels), human observers (target in 2022: 19% trip-level selection), and electronic monitoring (target in 2022: 30% trip-level selection).	None
Alaska (federal waters)	Individual Fishing Quota	Pot	Mandatory full retention, no size limit, no discarding allowed	Mix of zero coverage (<40 foot vessels), human observers (target in 2022: 17% trip-level selection), and electronic monitoring (target in 2022: 30% trip-level selection).	None
Alaska (state waters, Chatham Strait and Clarence Strait)	Equal Quota Share	Hook-and-line and Pot	Voluntary release program, no size limit, 3.75" escape rings required on all pots, flea bitten or dead fish must be retained. https://www.akleg.gov/basis/aac.asp#5.28.170 --- see (f) and (g) "A permit holder must retain all visibly injured or dead sablefish. Sablefish that are not visibly injured or dead may be released unharmed, but the permit holder must record the live releases in a logbook by gear settings."	None	Yes -- during Mark-Recap years, as many landings as possible are sampled. For all other years, we sample Mon-Fri work hours.
British Columbia	Individual Transferable Quota	Pot	All traps (pots) require two 3.5-inch escape rings. Minimum size limit for retention of 55 cm (approx. 21.65 in.). Sablefish <55 cm fork length are released by regulation in all fisheries. There are no quota deductions applied to releases of sub-legal fish (0% DMR). For legal sized sablefish	Electronic monitoring. 10% of hauls are video reviewed and tested against logbooks. It is up to fishery manager discretion to determine if 100% video review is required.	100% dockside monitoring provided by third party service provider

Region	Management program	Gear type	Regulations related to discarding (e.g., size limits, escape rings, application to quota)	At-sea monitoring	Port sampling
			that are released, there is a 100% DMR (100% of discards apply towards quota).		
British Columbia	Individual Transferable Quota	Hook & Line	Minimum size limit for retention of 55 cm (approx. 21.65 in.). Sablefish <55 cm fork length are released by regulation in all fisheries. There are no quota deductions applied to releases of sub-legal fish (0% DMR). 100% DMR for legal sized sablefish (100% of discards apply towards quota). Exception is troll gear for which there is a DMR of 15% for legal sized sablefish.	Electronic monitoring. 10% of hauls are video reviewed and tested against logbooks. It is up to fishery manager discretion to determine if 100% video review is required.	100% dockside monitoring provided by third party service provider
British Columbia	Individual Transferable Quota	Trawl	Minimum size limit for retention of 55 cm. Sablefish <55 cm fork length are released by regulation in all fisheries. There are no quota deductions applied to releases of sub-legal fish (0% DMR). DMR for legal-sized fish is a function of towing time (25% discard mortality rate for the first hour fished or portion thereof and, 25% for each additional hour)	Electronic monitoring. There are several categories of audit of trip data. Baseline video to logbook review is 10% of fishing events for wetboats and 25% of fishing events for receiving tank vessels (RTVs). Additional review is required for larger discrepancies between EM and at-sea log data.	100% dockside monitoring provided by third party service provider

Region	Management program	Gear type	Regulations related to discarding (e.g., size limits, escape rings, application to quota)	At-sea monitoring	Port sampling
West Coast	Limited Entry/Individual Fishing Quota	Trawl	Discarding allowed for all IFQ vessels EXCEPT "shoreside whiting" vessels (land >50% hake/whiting) engaged in maximized retention. Maximized retention allows for the discard of minor operational amounts of catch at sea if the observer has accounted for the discard. All IFQ discards count towards quota with 100% mortality applied to fish < 28 cm (age-0 fish) and 50% mortality rate applied to fish >= 28 cm	100% observed with a human observer or EM. ~20% of EM trips also carry an observer. Vessels 125 ft or longer engaged in at-sea processing (e.g., at-sea whiting catcher-processors and motherships) must carry two observers; all others must carry one.	100% dockside catch monitoring provided by third party service provider to verify landings, as well as generally less than 100% port sampling of biological data by the respective state departments of fish and wildlife.
West Coast	Limited Entry/Individual Fishing Quota	Hook-and-line and Pot	Discarding allowed, discards count towards quota with 100% mortality applied to fish < 28 cm (age-0 fish) and 20% mortality rate applied to fish >= 28 cm	About 30% coverage on average with human observer but varies depending on WCGOP capacity. Vessels 125 ft or longer engaged in at-sea processing must carry two observers; all others must carry one. VMS required when fishing in federal waters.	Generally less than 100% port sampling of biological data by the respective state departments of fish and wildlife.
West Coast	Open Access	Hook-and-line	Discarding allowed, 100% mortality applied to observed discarded fish < 28 cm (age-0 fish) and 20% mortality rate applied to fish >= 28 cm	About 5% coverage on average with human observer but varies depending on WCGOP capacity. VMS required when fishing in federal waters.	Generally less than 100% port sampling of biological data by the respective state departments of fish and wildlife