ANALYSIS OF SABLEFISH MANAGEMENT AND TRAWL ALLOCATION ATTAINMENT ISSUES

Produced for the October 2019 SaMTAAC Meeting

There are three main sections to this analytical document: a general analysis and background information on the gear switching issue (including industry profile information requested by the committee), analyses that apply across several of the alternatives (including information related to impacts of gear switching and choice of qualifying entities and qualification criteria), and a section with analyses that apply to certain provisions of specific alternatives. Since the document is long, sections generally start with a summary of the main take-away-points.

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General Analysis of Gear Switching Issue

With the implementation of the shorebased individual fishing quota (IFQ) program in 2011, there was an allowance for trawl permitted vessels to catch their quota pounds (QPs) with fixed gear (commonly referred to as "gear switching"). Sablefish was and continues to be the primary target of fixed gear vessels operating within the IFQ program, which has led to concerns about sablefish being a harvest constraint for trawlers fishing north of 36° N. lat.

History of Council Deliberations on Gear Switching

> *Section Summary: Gear switching opportunities were embedded in the structure of the original Amendment 6 license limitation program. The gear switching provisions of Amendment 20 were developed at a time when many perceived that there were conservation issues in connection with the trawl gear that warranted substantial reduction in its use. The path followed by the Council both helped trawl fishermen access their quota and allowed fixed gear participants to acquire trawl permits and quota; but stopped short of adopting a provision facilitating permanent conversion to fixed gear when a motion that would have selected that option was withdrawn in favor of a "go slow" approach.*

The management structures for gear-switching within the context of a limited entry (LE) program pre-date the implementation of Amendment 20 IFQ program, going back to the structure of the Amendment 6 license limitation program. Under the license limitation program (implemented in 1994), qualifying vessels received LE permits endorsed for trawl, longline and/or fishpot gear (LE gears). A vessel with an LE permit was allowed to fish the gear for which it was endorsed within the context of the LE fishery. Within the LE fishery, allocations were larger and regulations more liberal than those of the open access (OA) fishery. A vessel without a permit was allowed to fish any legal groundfish gear (including LE gears except trawl) within the context of the more restrictive OA fishery. A vessel with an LE permit could also fish gears for which its permit was not endorsed (gear switch). Such vessels were governed by OA management regulations but their harvest was counted against the LE allocation. So, under the Amendment 6 LE program, a vessel with an LE permit endorsed for trawl gear could use fixed gear or other OA gears; but its harvest would be governed by OA regulations and counted against the LE allocation.

Implementation of an IFQ program requires that an amount of fish be identified for management with IFQs. For the trawl IFQ program, this meant that the LE allocations had to be split between the trawl sector and others. This brought to the forefront the question of whether a trawl permitted vessel would continue to have the opportunity to use a non-trawl gear (gear switch), and if so, whether its catch would count against the trawl allocation (require IFQ) or some other allocation. In November 2008, the IFQ alternative identified that the scope of the program:

> . . . allows a limited entry trawl vessel to switch between trawl and nontrawl groundfish gears, including fixed gear, for the purpose of catching their QP ("gear switching"). It also allows a nontrawl vessel to acquire a trawl permit, and thereby use trawl QP to catch the LE trawl allocation using nontrawl gear. (Section A-1.1 of the IFQ Program)

One of the opportunities envisioned for gear switching was that it might allow trawl vessels to utilize quota that they would not otherwise be able to access in a mixed stock trawl fishery. Additionally, at that time, there was a perception by some that transitioning the fishery away from trawling would have a number of conservation benefits. Discussions about gear switching included the consideration of a permanent gear conversion provision. At its November 2008, the Council discussed a motion that would have adopted a program option requiring a permit holder that wished to gear switch for more than two-years to permanently commit to gear switching (gear conversion). At that time, given the uncertainty about how the program would perform, the motion was withdrawn in favor of a "go slow" approach that allowed gear switching, did not require it to be permanent, and would consider the gear switching issue again as part of the program review.

Historical Information on Sablefish Allocation Attainment and Gear Switching (2011-present)

Section Summary: The SaMTAAC expressed interest in a better understanding of what has happened with respect to gear switching since the start of the program, including how gear switching might have impacted attainment of the goals and objectives of the program. The sections below provide a fishery profile focusing on aspects of the fishery related to gear switching for northern sablefish, including allocation attainment and sablefish price trends, fleet and buyer profile on the participants in the fishery, ownership profiles, northern sablefish quota pound (QP) market information, and a community profile.

Fishery and Sablefish Market

Section Summary: This section is intended to provide an overview of the fishery and sablefish market of the IFQ fishery, with information on landings by gear type, price trends, and participant information. Overall,

- *the trawl sector northern sablefish allocation has been a highly attained species since at least 2007, with over 90 percent of the allocation being caught since 2011;*
- *fixed gear landings have accounted for an average of 29.8 percent of the total available sablefish north QPs since 2011; and*
- *prices for fixed gear sablefish have been on average of $0.88 higher per pound than trawl caught sablefish, however, there appears to be substantially less*

divergence in the market price for northern sablefish QP paid by trawlers and fixed gear vessels.

Trawl Allocations and Harvests

The trawl fishery includes an at-sea component, managed with co-ops, and a shorebased component, managed with IFQ. The latter is the sector of focus in this document, sometimes referred to as the "shoreside trawl sector/fishery" or "trawl IFQ sector/fishery". Prior to 2011, the shoreside trawl fisheries were managed via trip limits and vessels simply discarded sablefish when they hit a trip limit for a bimonthly period. While it was allowed prior to 2011, there was little if any use of fixed gear by trawl permitted vessels during that period (with the exception of vessels that also acquired an LE fixed gear permit or participated in The Nature Conservancy Exempted Fishing Permit). Figure 1 below shows the 2007-2018 northern sablefish allocations compared to total catch (without discard mortality) and the breakdown of total trawl sector landings and discards for trawl gear and fixed gear (fixed gear starting in 2011). While the management system was different, in order to have the best comparison, the 2007-2010 "Allocation" was the LE trawl allocation in regulation while the 2011-2018 "Allocation" is the actual IFQ allocation for sablefish north of 36° N. lat. Prior to 2011, the at-sea mortality of sablefish (less than 5 mt) was included in the total catch as there was no set aside at that time. Total catch from 2011-2018 is only from the shoreside IFQ fishery (i.e. no at-sea catch included).

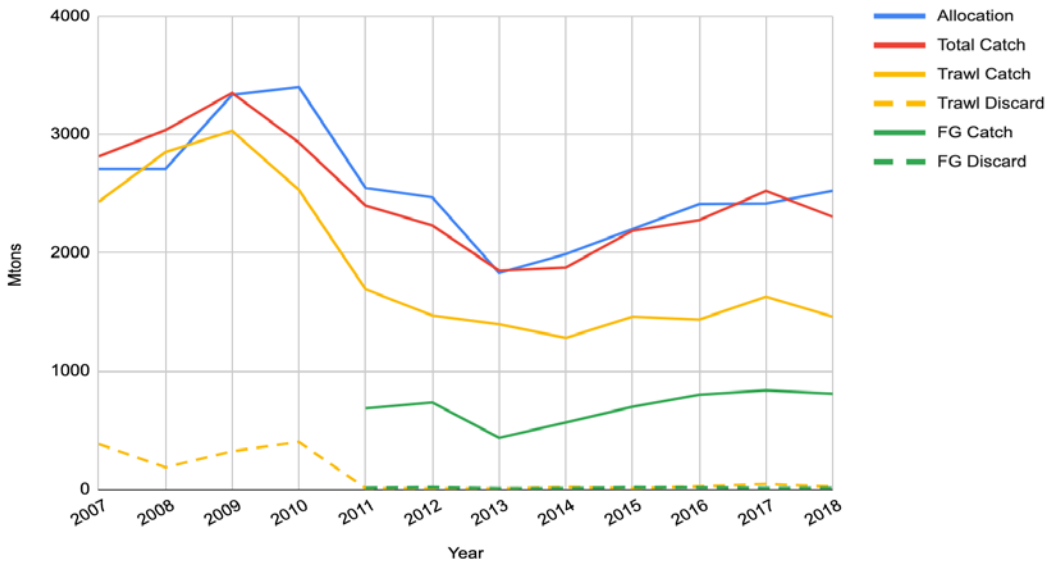

Figure 1. Sablefish north allocations, total catch, and total catch and discard by gear within the trawl IFQ sector, 2007-2018.

Table 1 below provides an update of Table 1 from the May 2019 SaMTAAC document and shows by area, the total available quota in millions of pounds (allocation plus surplus carryover)

and the total catch (not including discard mortality), and by gear type and area, the amount of quota caught and the percentage of the available pounds caught from 2011-2018. As a reminder, allocations are not changed each year to account for any carryover issued from the previous year and therefore there are typically QPs available in excess of the allocation.[1] Unless noted, total available pounds are used throughout the document as opposed to allocations in order to best examine trends compared to all the available quota with a year. Additionally, this table specifically refers to catch, not total mortality. Through 2018 (the period of this analysis), one QP was required to cover each pound of sablefish caught, including discards, even though some discards survived. At the same time, the West Coast Groundfish Observer Program (WCGOP) used discard mortality rates in the final year end calculations to determine total mortality for comparison against the sector allocation and annual catch limits (ACL). Beginning in 2019, vessel accounts were given "survival credits" for discarded sablefish to match the WCGOP estimates, such that less than one QP would be required to cover each pound discarded. A 20 percent discard mortality rate is applied for fixed gear and a 50 percent rate for trawl gear.

Sablefish north of 36° N. lat. ("sablefish north") QPs are highly utilized with over a 90 percent attainment rate of the IFQ allocation since 2011. For gear switching vessels, sablefish are the primary target species. For trawl vessels, sablefish are targeted in multi-species complexes (e.g., Dover sole, thornyheads, sablefish [DTS]) or are caught as bycatch in the midwater trawl sector. Over the last eight years, vessels using fixed gear have caught between 22.9 percent to 33.2 percent of the total available QPs in the north. Trawl vessels saw a high in 2013 of 72.1 percent utilization of the available IFQ quota to a recent low of 57.7 percent in 2018, the first year in which more than 10 percent of the available sablefish north QPs went unharvested. Southern sablefish QP utilization has declined since 2011, with 94.8 percent of the available QPs going unharvested in 2018.

[1] Carryover was not issued in 2011 or 2012

Table 1. **UPDATED** Sablefish available quota (millions of lbs, including carryover) and total catch (millions of lbs) by area and catch (millions of lbs) and percent attainment by gear type and area, 2011-2018 (Source GEMM).

Area	**Landing Year**		2011	2012	2013	2014	2015	2016	2017	2018
North	Available QPs		5.61	5.44	4.29	4.52	5.05	5.46	5.64	5.67
	Total Catch		5.29	4.92	4.07	4.13	4.82	5.02	5.56	5.08
	Trawl	Catch	3.75	3.26	3.09	2.86	3.24	3.22	3.69	3.27
		% of Avail. QPs	66.8%	59.9%	72.1%	63.3%	64.2%	58.9%	65.4%	57.7%
	Fixed Gear	Catch	1.54	1.66	0.98	1.27	1.58	1.80	1.87	1.81
		% of Avail. QPs	27.4%	30.5%	22.9%	28.0%	31.3%	33.0%	33.2%	31.9%
	Total Unharvested QP		5.8%	9.6%	5.0%	8.7%	4.5%	8.1%	2.4%	10.4%
South	Available QPs		1.17	1.13	1.43	1.57	1.72	1.89	1.86	1.90
	Total Catch (millions of lbs)		1.00	0.50	0.20	0.45	0.36	0.44	0.25	0.10
	Trawl	Catch	0.04	0.05	0.01	0.02	0.01	0.01	0.00	0.00
		% of Avail. QPs	3.2%	4.4%	1.0%	1.1%	0.9%	0.6%	0.1%	0.0%
	Fixed Gear	Catch	0.96	0.45	0.18	0.43	0.35	0.43	0.25	0.10
		% of Avail. QPs	82.3%	39.3%	12.8%	27.3%	20.2%	22.7%	13.5%	5.2%
	Total Unharvested QP		14.5%	56.3%	86.3%	71.6%	79.0%	76.7%	86.3%	94.8%

a/ Prior to 2019, survival credits were not given to IFQ vessel accounts. This table does not account for discard mortality, which is used in determining final year end estimates by WCGOP, and therefore should align with the vessel account database.

Along with the volume of fish the market is able to absorb, price is one of the most important factors determining a fishery's attainment of allowable harvests and species mixes, as vessels may choose to limit fishing in some fisheries if prices are better in another (e.g., Dungeness crab) or if it is not economically viable to fish. Table 2 below shows the average price per round weight pound of sablefish landed by area and gear type. Due to confidentiality, sablefish south of 36° N. lat. ("sablefish south") were unable to be stratified by gear type in reporting prices. For sablefish north, trawl prices have been consistently lower than fixed gear average prices, with differences ranging from $0.70 to $1.13.

Table 2. **UPDATED** Average price per rd. wt. lb for sablefish by area and gear type (Source: PacFIN).

Species	Gear	2011	2012	2013	2014	2015	2016	2017	2018
Sablefish N	Trawl	2.51	1.78	1.59	1.98	2.02	2.05	1.93	1.30
	Fixed Gear	3.53	2.49	2.31	2.68	2.74	3.07	3.06	2.28
Sablefish S	All	2.26	2.07	1.96		2.65		2.26	1.74

Looking closer at the average price per pound, sablefish receive different prices per pound for various sizes of fish. Table 3 below shows the average price per pound for sablefish north landed in the IFQ sector by gear type for 2011-2018. Due to confidentiality, "Small" and "Extra Small" grades were combined as were "Large" and "Extra Large". Additionally, there were some sablefish that did not have specified grades on the fish ticket and were left out of this particular table; therefore, these values only represent a subset of the total landings. Dealers also may have different standards that fit certain grades (e.g., one dealer's "small" could be another's "medium"). In order to provide a similar comparison for sablefish south, Table 4 shows the average price per pound by size (using same assumptions and groupings as above) for sablefish south landed in the IFQ and LE fixed gear (LEFG) fisheries. In general, larger fish result in a higher average price per pound. "Medium" grade fixed gear caught sablefish can sometimes bring in a higher price per pound than trawl caught large or extra large sablefish (2011, 2016).

Table 3. Average price per pound by grade and gear for sablefish north in the IFQ fishery, 2011-2018.

GEAR	GRADE	2011	2012	2013	2014	2015	2016	2017	2018
Trawl	Small/Extra Small	2.18	1.44	1.3	1.74	1.81	1.85	1.66	0.95
	Medium	2.66	1.95	1.71	2.15	2.39	2.36	2.5	2.02
	Large/Extra Large	3.57	2.88	2.36	2.53	2.69	3.02	3.05	3.12
Fixed Gear	Small/Extra Small	3.38	1.75	1.91	2.02	1.95	2.61	3.3	2.08
	Medium	3.58	1.93	2.12	1.65	2.09	3.21	2.31	2.76
	Large/Extra Large	4.47	3.55	2.81	2.9	3.53	3.89	3.68	3.63

Table 4. Average price per pound by grade for sablefish south landed in the IFQ and LEFG fisheries, 2011-2018.

Grade	2011	2012	2013	2014	2015	2016	2017	2018
Small/Extra Small	2.40	2.16	2.03	2.16	2.31	2.40	2.52	2.65
Medium	2.09	2.31	2.93	2.91	2.92	2.94	2.86	3.04
Large/Extra Large	2.32	2.74	3.58	3.03	3.08	2.80	2.87	2.80

An examination of the 2011-2018 correlation between average price per pound of sablefish north landed with fixed gear (Figure 2 top panel) and the percent utilization of available QPs by fixed gear (Figure 2 bottom panel) shows mixed results. Some years seem to show the expected positive relationship between fixed gear utilization of the QPs and the average price, with 2013 seeing the lowest utilization and the second lowest price and then utilization increased as the price increased from 2013-2016/7. However, other years, such as 2011 and 2018, do not show the expected relationship. The 2011 result may be due to the fact it was the first year of the program and while vessels were seeing high prices, they were just beginning to adapt to the new gear switching opportunities and considerable effort was being expended harvesting southern sablefish. For 2018, despite the lower price per pound vessels were receiving (the lowest across the eight years), utilization of trawl IFQ northern sablefish by fixed gear vessels was at one of the highest levels, 31.9 percent.

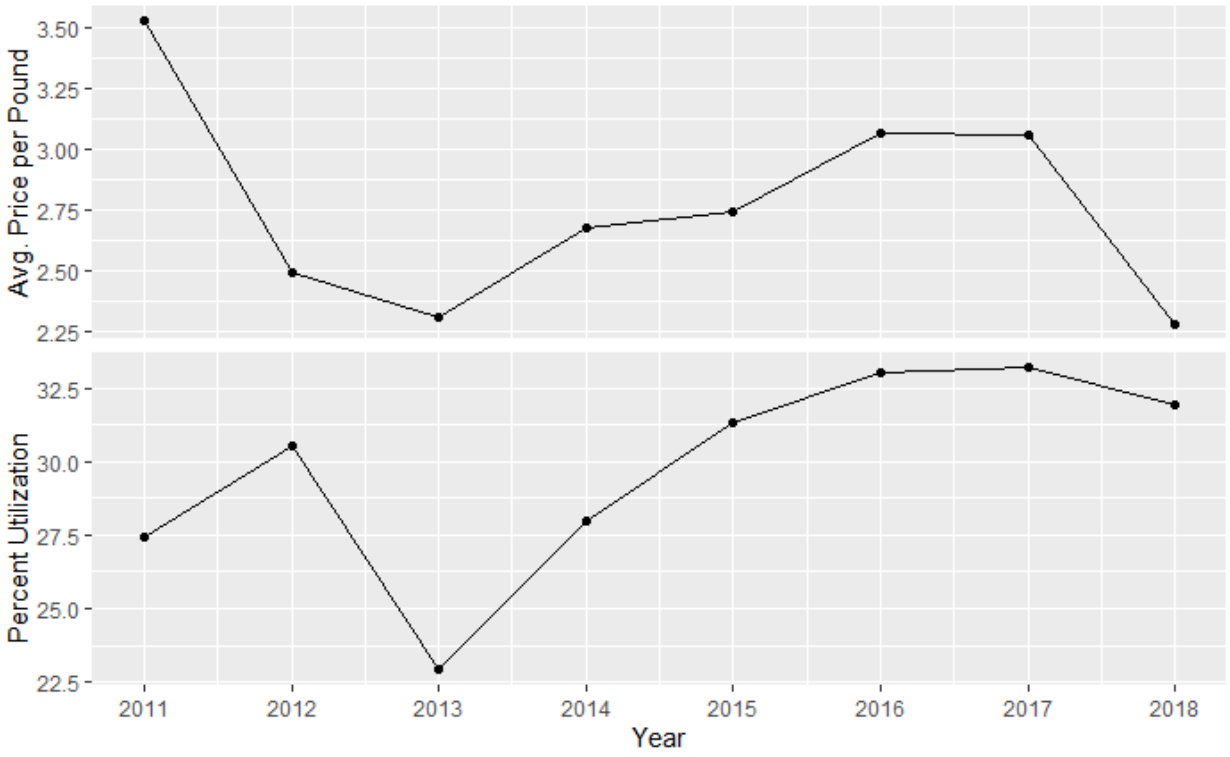

Figure 2. Average price per pound for fixed gear caught sablefish north compared to percent utilization of available sablefish north QPs by fixed gear, 2011-2018.

Along with alternative fishing opportunities, price may impact when in the year vessels are more likely to fish (an issue that may be of concern under Alternative 1 with respect to the date on which the trawl-only QP convert to any gear QP). Figure 3 below shows the average price per pound received for sablefish north by gear type and month from 2011-2018 in the IFQ program. Due to the limited amount of activity in the earlier months for fixed gear (discussed in more detail with Figure 4 below), all years were combined to meet confidentiality standards. Note that this limited activity will also drive the underlying prices for fixed gear, which is likely the cause of the jagged nature (i.e., "noise") of the curve. Ignoring the initial few data points until the summer months, overall, fixed gear prices tend to increase as the year progresses. Trawl prices can start higher earlier, decrease over the summer (similar to fixed gear), and then increase towards the end of the year.

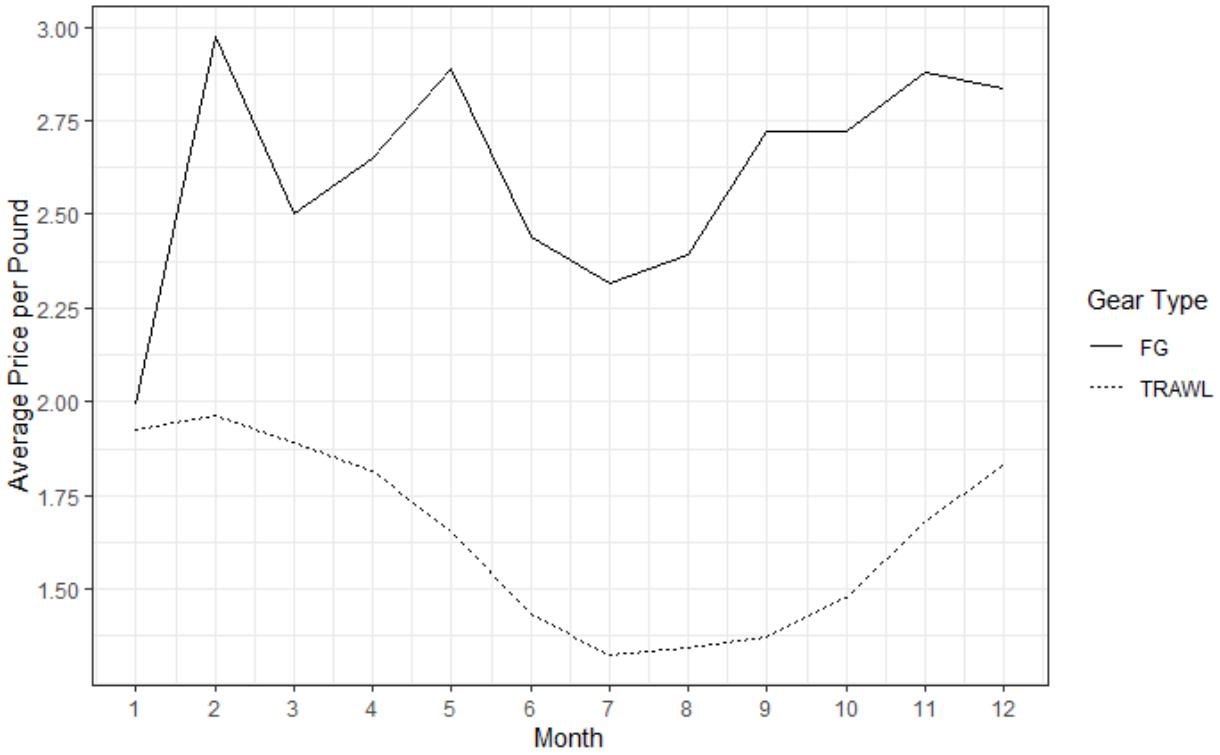

Figure 3. Average price per pound of sablefish north by gear type and month in the IFQ program, 2011-2018.

Gear Switching History (Quantity and Seasonality)

Looking closer at the seasonal trends of sablefish north landings, Figure 4 below shows the cumulative sum of sablefish north landings by gear in the shorebased IFQ sector for 2011-2018. In general, fixed gear landings tend to start in the late summer, accumulate more rapidly in the early fall and tail off in the late fall and early winter while trawl landings tend to accumulate at a steadier pace across the year. Fixed gear participants may participate in other fisheries in Alaska earlier in the year or the LEFG primary fishery before coming back to fish in the IFQ program.

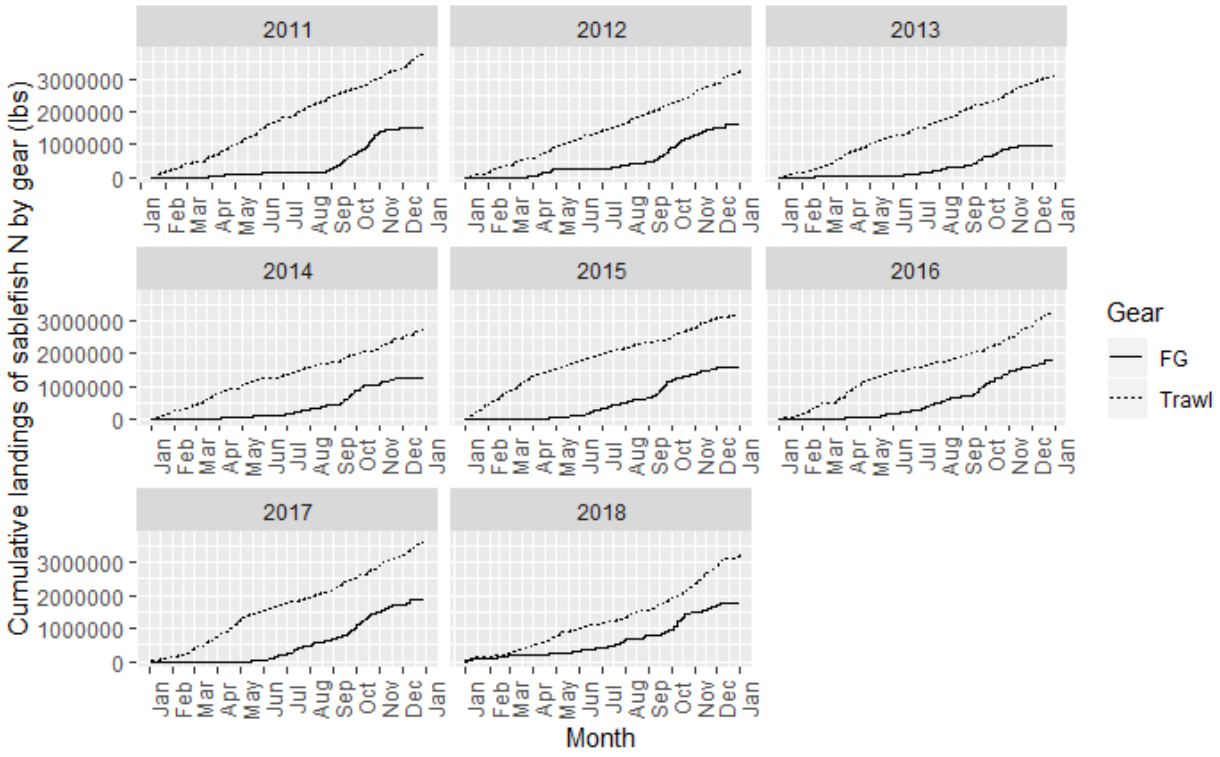

Figure 4. Cumulative sum of sablefish N landings by IFQ by gear type, 2011-2018

Fleet and Buyers

Section Summary: The SaMTAAC requested a fleet profile at their May meeting. This section is intended to provide an overview of the vessels, permits, and dealers that participate in the shorebased IFQ fishery for sablefish north, and particularly the portion of the fleet that gear switches. In addition, it explores some of the relationships between those vessels that gear switch in the north and the LEFG and southern sablefish fisheries. The following bullets reference the 2011-2018 period, unless otherwise noted.

- *39 distinct vessels and permits have gear switched for sablefish north*
- *Evaluated on an annual basis, the 75 to 86 non-whiting trawl vessels that harvest sablefish north has ranged from 4.4 to 7.2 times higher than the 11 to 21 vessels using fixed gear in the trawl fishery, with an average of two vessels a year using both trawl and fixed gear to harvest sablefish north*
- *Between 86 and 98 percent of all trawl permits used in the IFQ fishery are used to land northern sablefish, including non-whiting, whiting, and gear switching vessels.*
- *On an annual basis between 14 and 21 trawl permits were used for gear switching, representing only 6-12 percent of the total trawl endorsed permits available in a year (these permits were used on between 14 and 20 vessels).*
- *40-49 permits per year were latent (i.e. listed as "Unidentified") at some point during each year, with 14-32 being latent for the entire year*

- *5-9 vessels each year have participated in both the LEFG fishery and landed sablefish north with fixed gear in the IFQ sector*
- *9 vessels have landed sablefish north and south with fixed gear.*

Trawl Gear, Gear Switchers, and Buyers (Northern Sablefish)

From 2011-2018, there have been varying levels of vessels and permits participating in gear switching of sablefish north with 39 distinct vessels and 39 distinct permits participating overall. The highest levels of participation were seen at the start of the IFQ program in 2011 and 2012 (Table 5). The lowest year of participation by vessels and dealers was 2013 when there were only 11 vessels, which was also the year with the second lowest average price per pound and lowest total catch for fixed gear sablefish (Table 1,Table 2). After variable participation levels in the first years, participation levels have become more consistent in more recent years. Within this group, there have been ten vessels that have made landings of both trawl and fixed gear northern sablefish with an average of less than two vessels per year.

These gear switching vessels have delivered to between 10 dealers (in 2013) and 16 dealers (in 2012 and 2017) in any one year. Note that these dealer numbers are based off of state dealer license numbers. Overall, there were 39 distinct dealer numbers that purchased fish from gear switched vessels. Based on linking of dealer names, these 39 dealer numbers likely represented 26 independent businesses, with between 8 dealer businesses (in 2013) and 12 dealer businesses (in 2012) active in any one year.

Table 5. Number of gear switching vessels and LE permits that landed and the number of dealers who bought sablefish N of 36 with fixed gear in the shorebased IFQ program, 2011-2018.

Year	2011	2012	2013	2014	2015	2016	2017	2018
Number of Vessels	17	20	11	15	14	16	16	16
Number of Permits	17	21	11	14	14	16	16	16
Number of Dealers	15	16	10	14	13	12	16	12

Comparatively, the number of participating trawl vessels in each year was anywhere between 4.2 and 7.7 times greater than the number of gear switching vessels (including those who did both trawl and fixed gear) in a given year that landed sablefish north (Table 6).

Within the trawl sector, there are vessels that take sablefish north that participate in non-whiting trawl, shoreside whiting, and those that participate in both in the same year. As shown, the dominant group where sablefish is landed is the non-whiting trawl sector, which averages about 88 percent of the total sablefish north landings in the trawl sector and takes approximately 55

percent of the total available quota on average. In general, the shoreside whiting fishery sees little sablefish, with most years seeing less than two percent of the total landings.

Table 6. Number of trawl sector vessels using trawl gear that participated in the non-whiting, whiting, or both sectors from 2011-2018, and the percentage of sablefish north landings that sector made of the total IFQ trawl landings and of total available sablefish north QPs.

Year	Group	Total Vessels	Number of Vessels	Percentage of Sablefish N Trawl Landings	Percentage of Available Sablefish N QPs
2011	Both	86	13	14.31	9.52
	Non-Whiting		60	84.02	55.92
	Whiting		13	1.68	1.12
2012	Both	84	7	7.75	4.62
	Non-Whiting		60	89.21	53.15
	Whiting		17	3.04	1.81
2013	Both	85	7	9.13	6.55
	Non-Whiting		61	90.83	65.17
	Whiting		17	0.05	0.03
2014	Both	81	8	13.23	8.25
	Non-Whiting		56	86.38	53.87
	Whiting		17	0.4	0.25
2015	Both	76	9	12.12	7.72
	Non-Whiting		54	87.56	55.80
	Whiting		13	0.32	0.20
2016	Both	75	7	8.71	5.13
	Non-Whiting		52	90.89	53.56
	Whiting		16	0.4	0.24
2017	Both	80	9	10.36	6.63
	Non-Whiting		55	85.57	54.73
	Whiting		16	4.07	2.60
2018	Both	81	14	7.85	4.45
	Non-Whiting		55	90.16	51.10
	Whiting		12	1.99	1.13

When assessing trends in terms of permits, between 86-98 percent of all of the permits used in the IFQ fishery from 2011-2018 were used to land sablefish north (Table 7). However, the portion of those permits used to land sablefish north with fixed gear (Table 5) is only about 10-20 percent depending on the year. Given that there are 175 LE permits with trawl endorsements available[2], fixed gear landings of sablefish north have only occurred on 6-12 percent of the available permits.

As an indicator of the possible availability of additional permits that might be acquired and used for gear switching, Table 7 and Figure 5 also provide the number of latent permits (i.e., not assigned to a vessel). Overall, there have been 40-49 trawl endorsed permits each year that are latent at some point throughout the year, and of those permits, there were 14-32 permits that were latent for the entirety of the year (Table 7). Some of these permits were not assigned for

[2] GF0031 and GF0051 were combined with two other permits in 2012 to increase the endorsed length and therefore "expired" after 2011.

the matter of a day or two while others a few months as shown in Figure 5. This was likely due at least in part to vessels participating in LEFG fisheries and being unable to have both permits on the same vessel. Beginning in 2017, fishermen were allowed to have both trawl and fixed gear LE permits on registered to a vessel at the same time. Regardless, there are latent permits that could be available for any IFQ participants to use (via purchase or leasing) to harvest sablefish north with trawl or fixed gear.

Table 7. Number of Permits that landed sablefish north, number of permits with IFQ landings, number of latent permits, number of permits with no IFQ landings, and total trawl endorsed permits available, 2011-2018.

Year	Number of Permits that Landed Sablefish N	Number of Permits with IFQ Landings	Latent Permits		Total Trawl Endorsed Permits Available
			Vessels Associated with Permit "Unidentified" For Entire Year	Permits with No IFQ Landings	
2011	104	116	14	61	177
2012	100	108	23	67	175
2013	94	109	26	66	175
2014	95	105	24	70	175
2015	88	93	25	82	175
2016	86	93	32	82	175
2017	93	95	25	80	175
2018	93	96	28	79	175

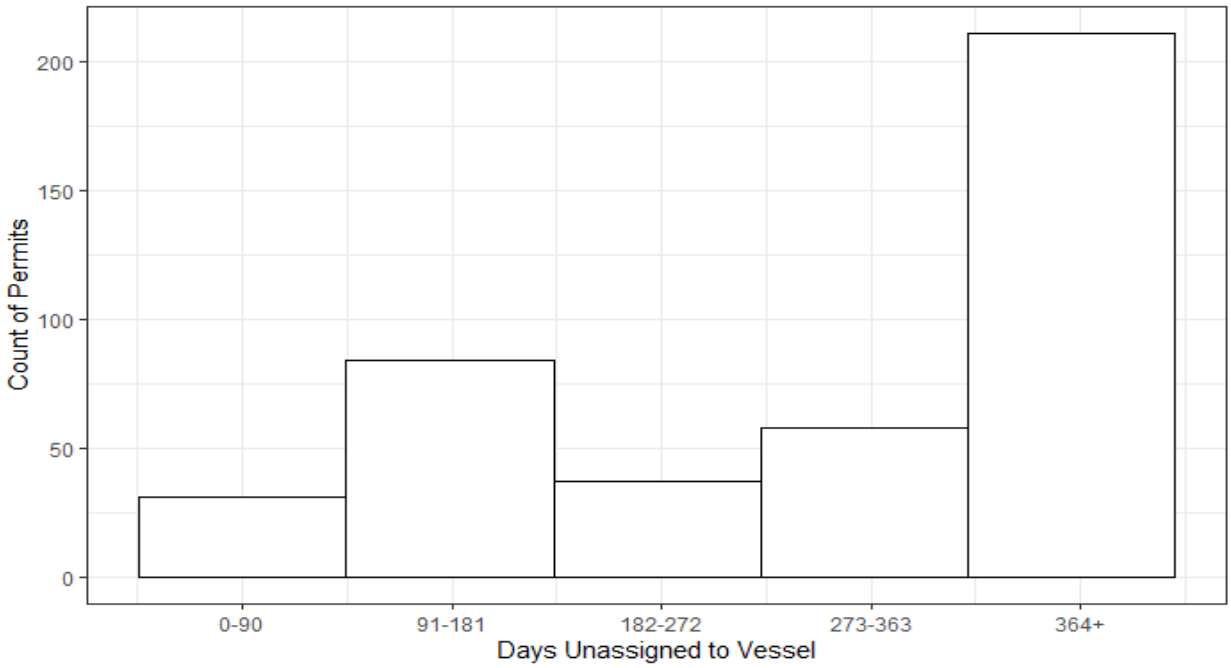

Figure 5. Histogram of the number of trawl endorsed LE permits that were not assigned to a vessel for a certain number of days, 2011-2018

In addition to gear switching sablefish north, there are some vessels that also participate in the LEFG fishery (primary and LE daily trip limit [DTL]) and some that also gear switch south of 36° N. lat. The following two sections look at the relationships between those vessels that gear switch sablefish north and their activity in these other fisheries.

LEFG Sector Relationship

Prior to the implementation of the trawl IFQ program, while trawl permitted vessels were allowed to use fixed gear, virtually all vessels using fixed gear did so in the LEFG and OA fisheries against the respective allocations for each of these sectors. The LEFG allocation is available to those vessels participating in the primary/tier fishery and the LE DTL fishery. Vessels must have a sablefish endorsed fixed gear (longline or pot) LE permit to fish in the primary/tier program and/or LE DTL fishery or can fish in the LE DTL sector with a fixed gear permit without a sablefish endorsement.

There have been 14 distinct vessels that have participated in both the fixed gear IFQ and LEFG fisheries since 2011. In each year, approximately half of the IFQ gear switching vessels also participate in the LEFG fishery (Table 8). Note that these vessels only used fixed gear within the IFQ fishery and do not have a record of trawling for sablefish north. Additionally, there were fewer than three vessels that participated only in the DTL fishery (i.e., not primary) and the IFQ fixed gear fishery. Overall, these fixed gear vessels that participate in both fisheries represent a very small proportion of either fleet. In terms of revenue, these fixed gear vessels participating

in both fisheries get between 50.2-64.2 percent of their average ex-vessel revenue from groundfish from sablefish north landings in the IFQ fishery (Table 8).

Table 8. Number of shorebased IFQ trawl and gear switching vessels that landed sablefish north, number of vessels that participated in both the IFQ program and LEFG fishery, number of vessels that landed in the LEFG primary fishery, and the percentage of total groundfish revenue from IFQ sablefish north for those vessels who participated in both the IFQ and LEFG fishery.

Year	Number of Trawl-Only Vessels Landing Northern Sablefish a/	Number of Gear Switching Vessels b/	Total IFQ Vessels Landing Northern Sablefish	Vessels that participated in both the IFQ and LEFG fishery c/	Number of Vessels that landed in the LEFG primary fishery	Percentage of Total Groundfish Revenue from IFQ sablefish for those vessels who participated in both LEFG and IFQ
2011	83	17	100	6	98	54.3
2012	79	20	99	9	95	55.6
2013	80	11	91	5	89	64.2
2014	77	15	92	7	84	50.2
2015	74	14	88	7	86	60.7
2016	69	16	85	8	85	56.8
2017	77	16	93	6	85	62.5
2018	77	16	93	8	83	54.6

a/Includes whiting and non-whiting vessels that harvested sablefish north of 36° N. lat.
b/ Gear switching vessels include those vessels that used only fixed gear to land sablefish north and those that used both trawl and fixed gear in a given year to land sablefish north
c/ Includes fewer than three vessels that participated only in the LEFG DTL fishery.

Relation to Southern Sablefish Gear Switching

Of those vessels that landed sablefish north with fixed gear, some also gear switched sablefish south of 36° N. lat. As shown in Table 1 above, the majority of sablefish south IFQ landings are taken with fixed gear. There have been nine out of the 39 northern gear switching vessels that also landed sablefish south with fixed gear. Table 9 below shows the number of gear switching vessels that landed both sablefish north and south in a given year, the average number of QPs landed in each area by those vessels, and the overall percentage of these vessels total sablefish landings from each area. Due to confidentiality, 2014-2015 and 2017-2018 were combined. For a majority of the years, a higher proportion of sablefish landings by these vessels are taken north of 36° N. lat. However, in certain years (2011 and 2016), the average landings by this group of vessels were higher in the south. Given that 2011 and 2016 had the highest and second highest price per pound in the north (Table 2), it is unclear from the data of why there was this switch in trends.

Table 9. Number of gear switching vessels that landed sablefish both N and S of 36° N. lat. and the average landings of sablefish (rd. wt. lbs) and overall percentage of sablefish landed by those vessels in a year(s) north and south.

Year		2011	2012	2013	2014	2015	2016	2017	2018
Number of Vessels		4	3	3	3		3	6	
North	Avg. Lbs	97,415	92,296	80,874	142,998		62,215	83,777	
	% of Landings	44.4	54.3	68.8	59.6		37.7	68.2	
South	Avg. Lbs	122,225	77,647	36,673	97,078		102,933	39,006	
	% of Landings	55.6	45.7	31.2	40.4		62.3	31.8	

To further look at the trends driving the values in Table 9, Figure 6 shows the relative fixed gear sablefish landings of the nine vessels north and south across the eight years. Dummy IDs are given for reference purposes only and do not imply any kind of ranking. While the proportion of QPs taken north and south varies by year, there are some vessels that show a distinct dependence on one stock than another. For example, vessel 5 had a relatively large amount of landings of sablefish north compared to other vessels and had the smallest amount of landings of sablefish south compared to others. While the alternatives that pertain to sablefish south have been tabled from consideration by the SaMTAAC, the alternatives that restrict gear switching north of 36° N. lat. may impact some of these vessels more than others. Some may be able to focus more on sablefish south landings; however, the price and availability (i.e., concentration of schools) of southern sablefish may limit the ability to balance out any losses. Overall, restrictions on gear switching in the north without a restriction in the south may encourage more fixed gear vessels to enter into the southern sablefish IFQ fishery.

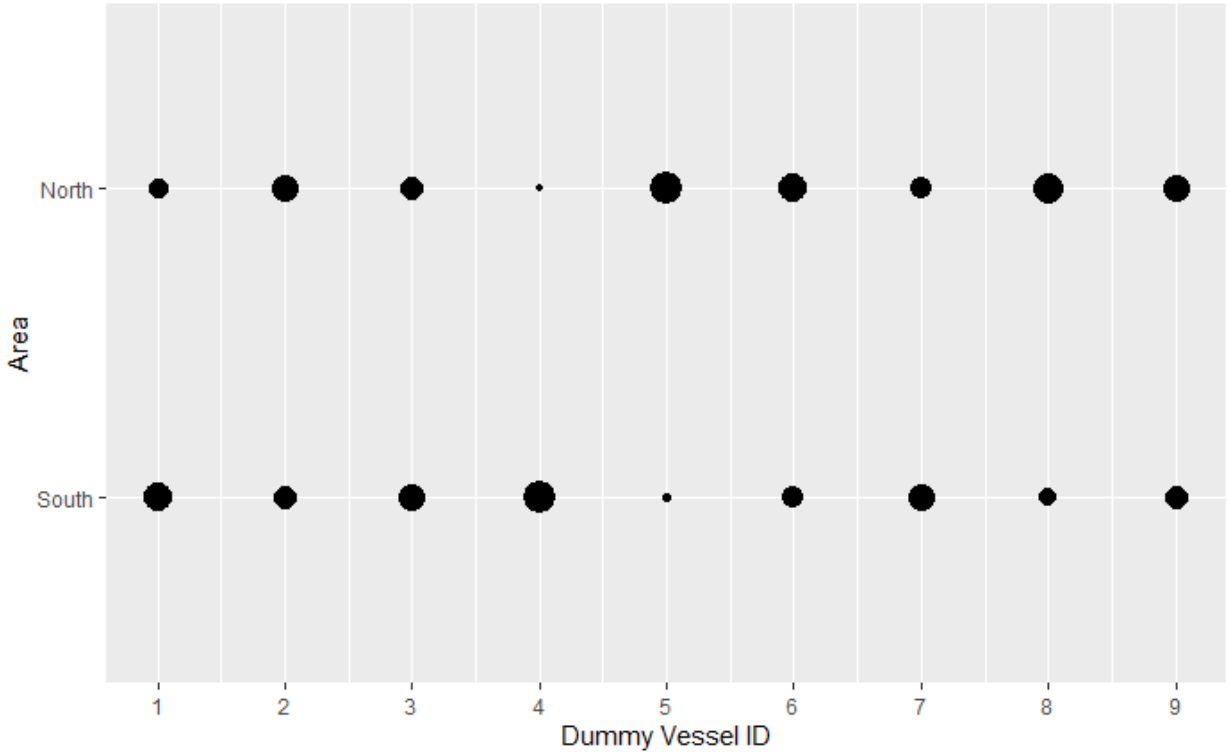

Figure 6. Relative proportion of sablefish landed with fixed gear north and south from vessels that fished north and south in at least one year, 2011-2018.

Ownership

Section Summary: This section looks at trends in QS and LE permit ownership by vessel owners, permit owners, and first receivers, focusing in particular on businesses involved in gear switching.

Quota Ownership

Section Summary:

- Initially, all 90 percent[3] of the sablefish north QS that was allocated went to LE permit owners and since trading started in 2014, the amount owned by permit or vessel owners has declined to 86 percent.
- Four percent of all northern sablefish QS is now held by entities that do not appear to have any other involvement in the IFQ fishery.
- First receivers that owned LE permits initially received 10 percent of the allocation.
- The amount of QS owned by gear switching entities has averaged about 15 percent, and has been relatively stable since the number of gear switching vessels stabilized at just over 15 (since 2014).

[3] 10 percent of all categories of non-whiting QS held back for the Adaptive Management Program (AMP).

- There has been a total of 27 arms-length northern sablefish QS transactions, 16 involving a trawl vessel purchaser, 8 involving a gear switcher purchaser, and 3 involving a processor purchaser.

A total of 90 percent of the northern sablefish quota share (QS) was allocated to permit owners and 10 percent was held out for the Adaptive Management Program (AMP).[4] Thus, Figure 7 shows that in the first year of the program, all 90 percent went to entities that held a permit (who may also have owned a vessel). Among those entities were first receivers that owned LE permits and they received about 10 percent of the QS (a portion of the 90 percent). Since the start of the program, the amount of QS held by permit and/or vessel owners has declined to 86 percent, the amount by first receivers declined to six percent then came back up to nine percent, and the amount owned by entities that only own QS has increased from zero to four percent.

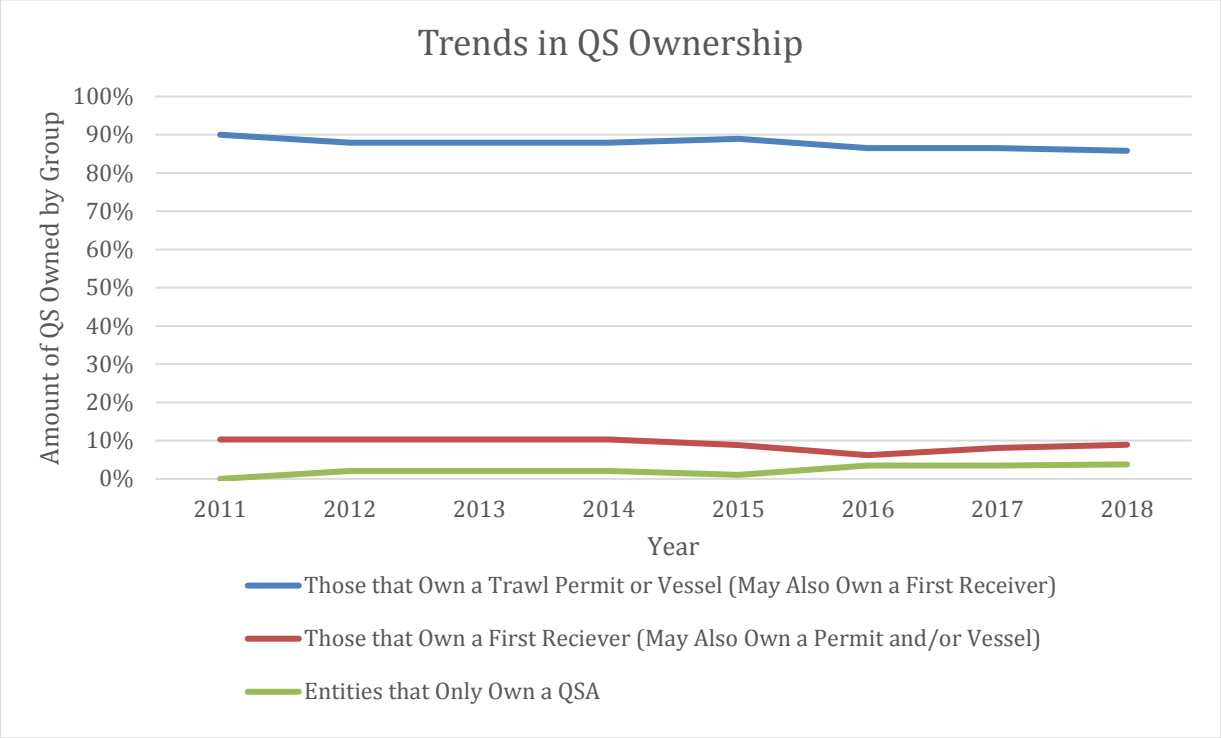

Figure 7. Amount of QS owned by those that own trawl permits and vessels, those that are first receivers and entities that only own quota share accounts (QSA) (total QS issued is 90 percent and there is double counting between first two categories), 2011-2018. (Internal Reference: Permits_Public_Results_IV.xlsx, QS Ownership)

While the amount of northern sablefish QS owned by businesses that own a trawl permit or vessel is running just below 90 percent, the amount owned by businesses that gear switch with

[4] An Adaptive Management Program has not been developed and therefore the additional 10 percent of AMP QP that would otherwise be allocated is going to those that hold the 90 percent of the shares that were allocated.

their trawl permit or vessel has varied between around 10 to 20 percent (Figure 8). For this graphic, participation is evaluated on an annual basis so that the amount of QS owned by gear switchers is not driven just by the trading of QS, but also by which vessels and permits gear switch in a particular year. Since 2014, the annual number of gear switchers has stabilized at just over 15 (Table 5) and the total QS owned by the businesses owning those vessels has stabilized an average of about 15 percent (Figure 8).

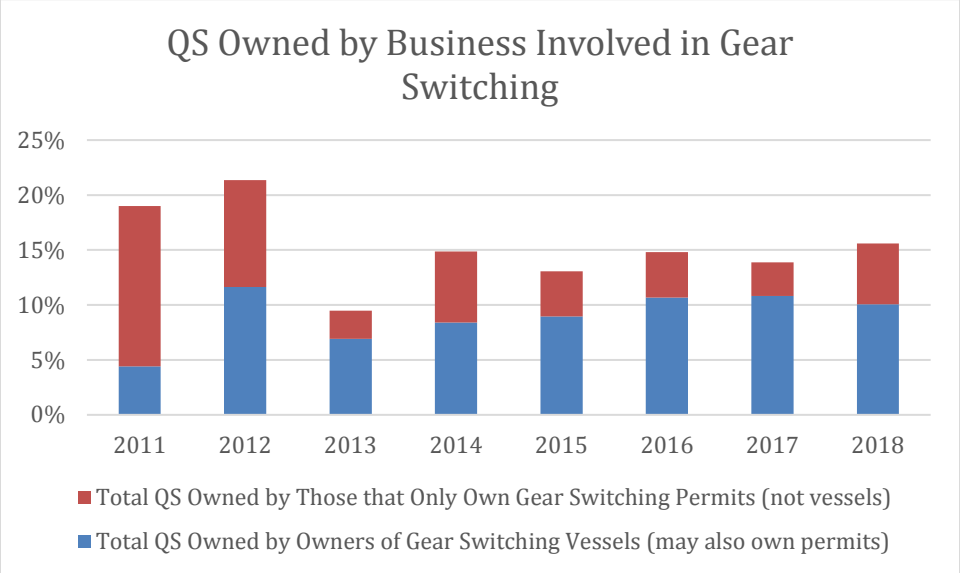

Figure 8. Amount of QS owned by businesses that own vessels (and may also own trawl LE permits) and the amount by businesses that own LE permits but not trawl vessels), 2011-2018.
(Internal Reference: Permits_Public_Results_IV.xlsx, QS Ownership)

In terms of QS transactions between unrelated parties, (arm's length transactions), about 60 percent have been by trawl businesses, 30 percent by gear switchers, and about 10 percent by businesses involved in processing (Table 10). The Northwest Fisheries Science Center provided an analysis of QS transactions categorized by the nature of the transaction (e.g. Arm-in-Arm or Arm's Length) and, for arms-length transactions, the participation category of the buyer (trawler, gear switcher, processor). Only one-third of all QS transactions are considered arm's length transactions.

Table 10. Northern sablefish QS transaction count (2014-2019).

Class [a/]	2014	2015	2016	2017	2018	2019	Total
Arm-in-arm transactions	2	20	2	0	2	2	28
Arm's length transactions	3	6	4	4	8	2	27
Gear switcher	1	3	3	0	1	0	8
Processor	1	0	0	1	1	0	3
Trawler	1	3	1	3	6	2	16
Community fund	1	3	2	2	3	4	15
Trusts/Full Operation Transfers	1	1	0	3	4	2	11
Total Annual Transactions	7	30	8	9	17	10	81

a/ Definitions:
- Arm-in-arm - common ownership between the two companies
- Arm's length - no shared ownership between the two companies
- gear switcher - company associated with gear switching (can be a processor or a fisher/vessel)
- processor - processing company without linkages to gear-switching
- trawler - all companies buying quota without linkages to processing or gear-switching operations
- Community fund - either the seller or the buyer (or both) is a TNC-affiliated community quota fund - Trusts/Full Operation Transfers - I put these transactions into a separate category because it is unlikely that the price of the trade is reflective of the value of sablefish quota or of the functioning of the market

Vessel Ownership and Permit Leasing

Section Summary:

- Roughly half of the gear switching vessels lease their permits.

In addition to leasing QS (selling QP) to gear switching entities, some businesses may be earning income from gear switching by leasing trawl permits. About half of the vessels that gear switch own their permits while the other half lease. In Table 11, any situation where the vessel owner and the permit owner appeared to be different businesses was classified as a lease. This evaluation was based on publicly available information on the ownership of vessels and permits: primarily owner name, address, and state records on corporate ownership.

Table 11. Count of gear switching vessel owners that own their own permit and those that lease.

	2011	2012	2013	2014	2015	2016	2017	2018
Vessel Leases Permit	9	11	4	9	7	7	7	9
Vessel Owns Permit	8	10	7	6	7	9	9	7
Total Gear Switching Vessels	17	20[a/]	11	15	14	16	16 [a/]	16

(Internal File Reference: Permits_Public_Results_III.xlsx; GS Vessel Ownership & Leasing)
a/ The sum of the number of vessels leasing a permit plus those owning a permit is greater than the total because of mid-year changes in permit status.

First Receivers and Related Assets

Section Summary:

- An annual average of about 25 percent of all gear switching vessels are owned by a business associated with a first receiver license (an annual average of just under four gear switching vessels).
- An annual average of 17 percent of all vessels and permits owned by first receivers are engaged in gear switching.

Businesses buying IFQ fish are required to hold a first receiver license from the Federal government. First receiver businesses participate in the IFQ fishery in a variety of ways including QS ownership, permit ownership and vessel ownership. An annual average of just under four gear switching vessels were owned by first receivers from 2011 through 2018, compared to an average of just under 16 total gear switching vessels (Table 5). Thus, an annual average of 25 percent of gear switching vessels were owned by first receivers. An annual average of 17 percent of all first receiver owned vessels engaged in gear switching. Similarly, an annual average of 17 percent of all first receiver owned trawl permits engaged in gear switching.

Table 12. QS, vessels, and limited entry permits owned by first receivers.

	2011	2012	2013	2014	2015	2016	2017	2018
Total Number of First Receivers	51	51	42	44	44	41	47	42
Number of First Receivers Receiving Gear Switched Sablefish North[a/]	Estimated at an average of 13.5 based on state dealer records. (Table 5)							
North QS Owned	10.3%	10.3%	10.3%	10.3%	8.9%	6.2%	8.1%	8.9%
Trawl Permitted Vessels Owned	27	28	26	26	23	22	20	19
Gear Switching Vessels Owned	5	5	3	3	3	3	5	4
Trawl Permits Owned	25	25	25	25	23	22	20	20
Gear Switching Permits Owned	4	4	3	3	3	4	5	5

(Internal File Reference: Permits_Public_Results_III.xlsx; First Receivers)

a/ While first receivers counts should be correlated with the dealer counts based on state dealer numbers provided in Table 5, the data set used for this study includes other information used to link ownership among holders of Federal First Receiver licenses. PacFIN is in the process of developing a table that will allow us to more easily link the state dealer identifiers with the Federal First Receiver licenses.

QP Market

Section Summary:

- *On average the amount of QP traded among vessel accounts equals about 75 percent of all QP issued.*
- *The amount of QP transferred from QS accounts for cash or barter considerations has generally increased over the course of the program, and was at 23 percent in 2018, while the QP transferred between vessel accounts for cash or barter considerations has varied but averaged almost 50 percent.*

- *An average of 21 percent of all QP issued is leased by gear switching vessels; and the amount of gear switched QP that comes from QS accounts owned by gear switchers average about 9 percent of all QP issued (Table 13).*
- *Available data on northern sablefish QP trade prices does not indicate a statistically significant difference between prices paid by trawl businesses as compared to those involved in gear switching.*
- *QP transfers from QS accounts are heavy at the start of the year and QP trading among vessel accounts tends to be heavier toward the end of the year than the earlier part of the year--peaking in September, on average.*

Volume of Northern Sablefish QP Trading

One of the topics of discussion in the committee's deliberations on gear switching has been the number of QS owners that count on generating revenue by selling their QPs to gear switchers. These individuals are dependent on market prices for quota which are influenced by a number of factors including the total demand for quota (impacted by whether gear switching is allowed) and the price businesses are willing to pay for quota (which could also be impacted by whether gear switching is allowed). Virtually all northern sablefish QP are transferred from a QS account directly to a vessel account, in part due to a requirement that QP be transferred to vessel accounts (VA) by September 1st each year.[5] After transfer to a VA, QP can only be transferred between vessel accounts, not back to or between QS accounts. Therefore, the amount of QP transferred from QS accounts to VA is generally representative of the total amount of QP issued each year (Figure 9), although there are some small amounts of carryover QP that are deposited directly into vessel QP accounts each year.[6] On average, the amount of northern sablefish QP transferred between VA is equal to about 75 percent of the total QP issued each year (some QP is transferred multiple times, so that does not mean that 75 percent of all QP is transferred between VA). In 2018, QP transferred as a percent of total QP jumped to 90 percent (Figure 9). The total northern sablefish QP traded between vessel accounts provides an initial indicator of the degree to which the WDFW proportional method for connecting QS accounts to vessel accounts will also involve assessing trades between QP accounts (see QS Account section on page 62).

[5] The Council recently recommended to NMFS that the September 1st requirement be discontinued and this change is expected to be implemented for 2020.
[6] Generally less than 4.7 percent are deposited directly to vessel accounts, see Table 23 on page 49.

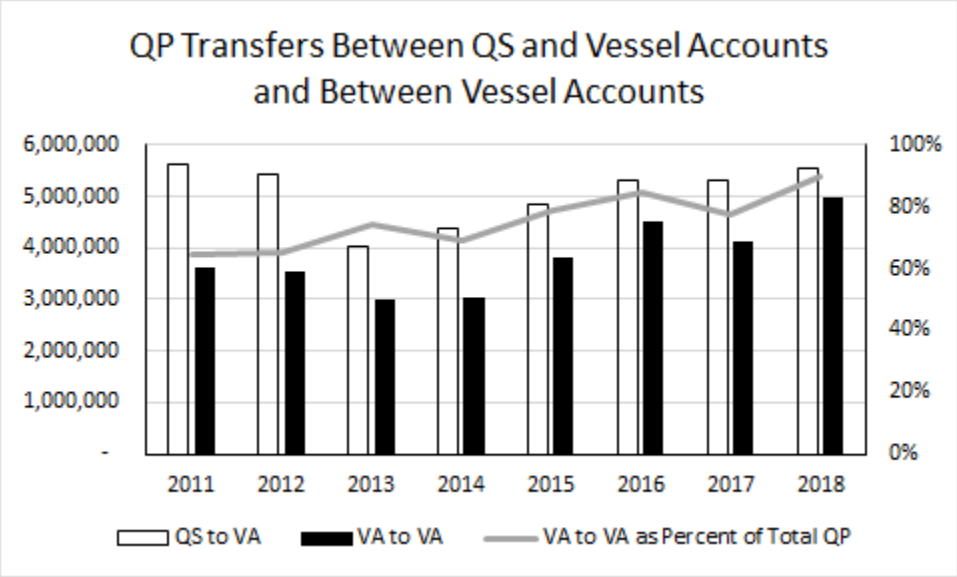

Figure 9. Annual amount of northern sablefish QP transfers (2011-2018). (Internal Reference File: Annual-summary-with-Bus_ID_2019-07-02_Update(Aug 28).xlsx:Transfer Totals)

When QP is traded, those involved in the transaction are asked to classify the trade as self, cash, barter, or other. The left side of Figure 10 shows that at the start of the program about nine percent of the QP transferred from QS accounts was reported as transferred for barter or cash (as opposed to QS owners that were transferring QP to their own account or reported the transfer as "other"). This amount has increased steadily from year-to-year until in 2018, 23 percent of all such transfers fell into this category. At the same time, an average of almost 50 percent of all QP transfers between vessel accounts are reported as barter or cash (a value that has ranged between a low of 39 percent and a high of 60 percent, right side of Figure 10).

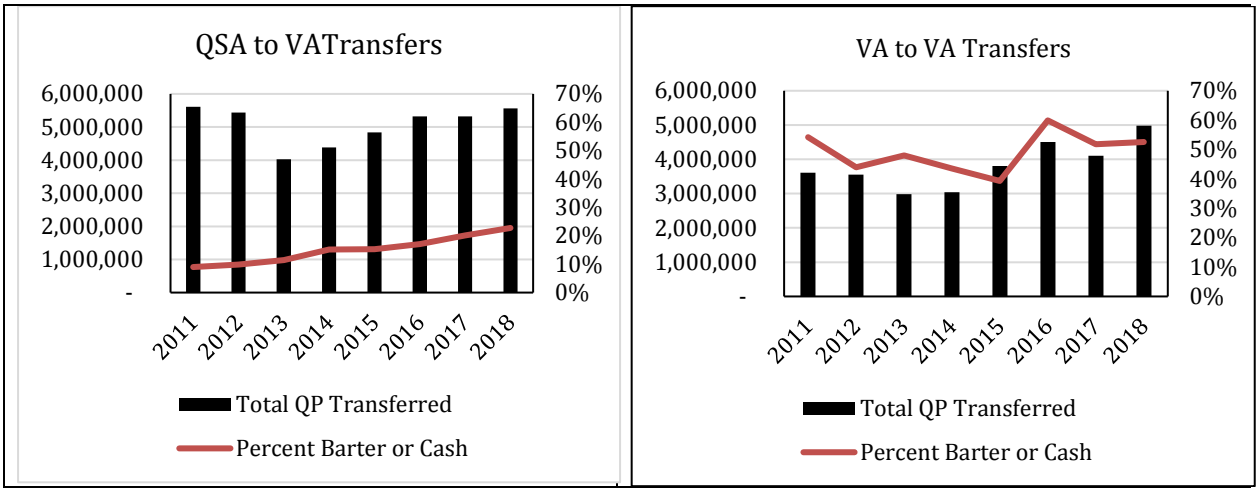

Figure 10. Total QP transfers from quota share accounts (QSA) to vessel accounts (VA) and between vessel accounts along with the percent involving cash or barter (2011-2018).

QP Acquired by Gear Switchers

Above, the amount of QS owned by gear switchers is discussed (Figure 8, page 26). In this section, that information is combined with information on total QP gear switched to imply the amount of QP acquired (leased) each year by gear switching vessels. On average, about 30 percent of all QP issued is used for gear switching, about 21 percent of all QP is leased by gear switching vessels for use in gear switching, and about 9 percent comes from QS owned by gear switching vessels (Table 13). Thus, on average, about 70 percent of the QP used by gear switchers is leased from entities that are not gear switching and that number has been relatively stable since 2013 (Figure 11).

Table 13. Estimation of QP leased by gear switching vessels.

	2011	2012	2013	2014	2015	2016	2017	2018
QS Owned	QS							
by Owners of GS Permit(s) and Vessel(s)	4%	10%	6%	7%	8%	10%	11%	8%
by Those that Only Own GS Vessel(s)	1%	1%	1%	1%	1%	1%	0%	3%
Subtotal for Those Owning Vessels	**4%**	**12%**	**7%**	**8%**	**9%**	**11%**	**11%**	**10%**
by Those that Only Own GS Vessel Permit(s) (permits leased to gear switching vessels)	15%	10%	3%	6%	4%	4%	3%	6%
Total QS Owned by Businesses Involved in Gear Switching	**19%**	**21%**	**9%**	**15%**	**13%**	**15%**	**14%**	**16%**
Total QP Gear Switched Catch (millions)	1.5	1.6	1.0	1.2	1.6	1.8	1.9	1.8
QS equivalent for	Catch Converted to QS Equivalent Based on Quota Allocated for the Year (Carryover Not Included)							
vessel owner that own a trawl LEP	14%	15%	14%	15%	15%	14%	18%	13%
vessel owner that lease a trawl LEP	13%	15%	9%	13%	17%	20%	17%	19%
Total QS Equivalent	**27%**	**30%**	**24%**	**28%**	**32%**	**34%**	**35%**	**32%**
Implied Percent of QP Leased by Vessels (Total QS equivalent minus QS owned by those owning vessels)	22%	18%	17%	20%	23%	23%	24%	22%

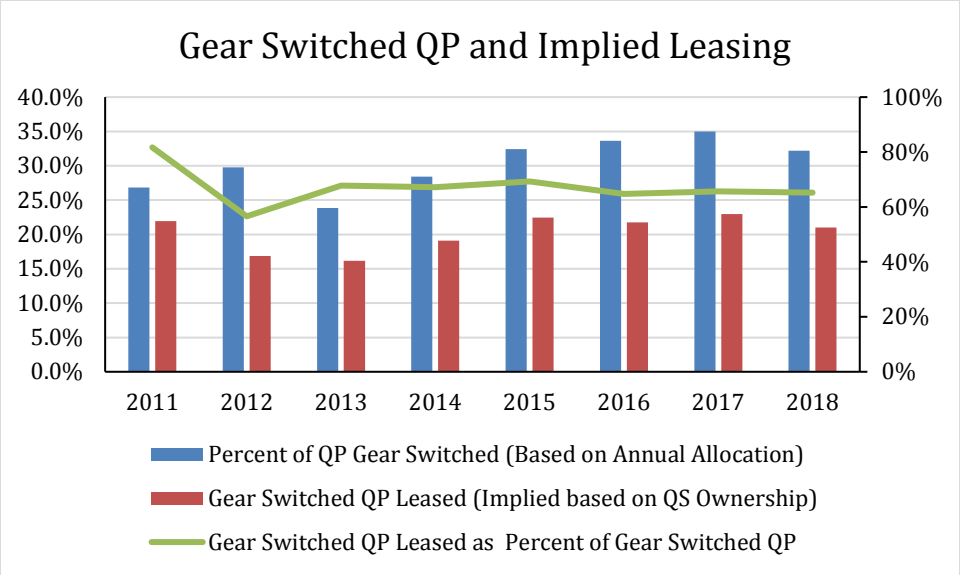

Figure 11. Percent of total QP gear switched annually and amounts leased.

There have been several discussions around the idea that fixed gear operations are willing (and can) pay a higher price for quota compared to trawl entities, due to the price per pound that is received for the product. At the same time, sablefish is of value to trawlers because it is caught as part of a complex in which a number of other revenue generating species are caught. The analysis below looks at reported northern sablefish QP prices grouped by the quarter of the year in which the trade was made and whether the buyer was a trawl business or a business involved in gear switching. For a number of quarter/gear type groups of QP price data, the average prices paid for QP by gear switching entities appears to be slightly higher than that for trawl entities and there appears to be a slight downward trend in the averages during the year. However, based on the transaction data available to date the differences between prices by entity type and across the year do not appear to be statistically significant (Figure 12). The greatest differences in averages was a lower price paid by trawlers buying from vessel QP accounts in the first quarter of the year and a lower price paid by gear switchers buying from QS accounts in the second quarter of the year. In Figure 12, the dark lines represent prices paid by gear switching entities and the grey lines by trawl entities. The solid lines represent purchases from QS accounts and the dotted lines from vessel accounts. The lines extending above and below the dots that indicate the averages represent one standard deviation above and below the median price, and since all the lines overlap, this indicates that there is not a statistically significant difference between the prices.

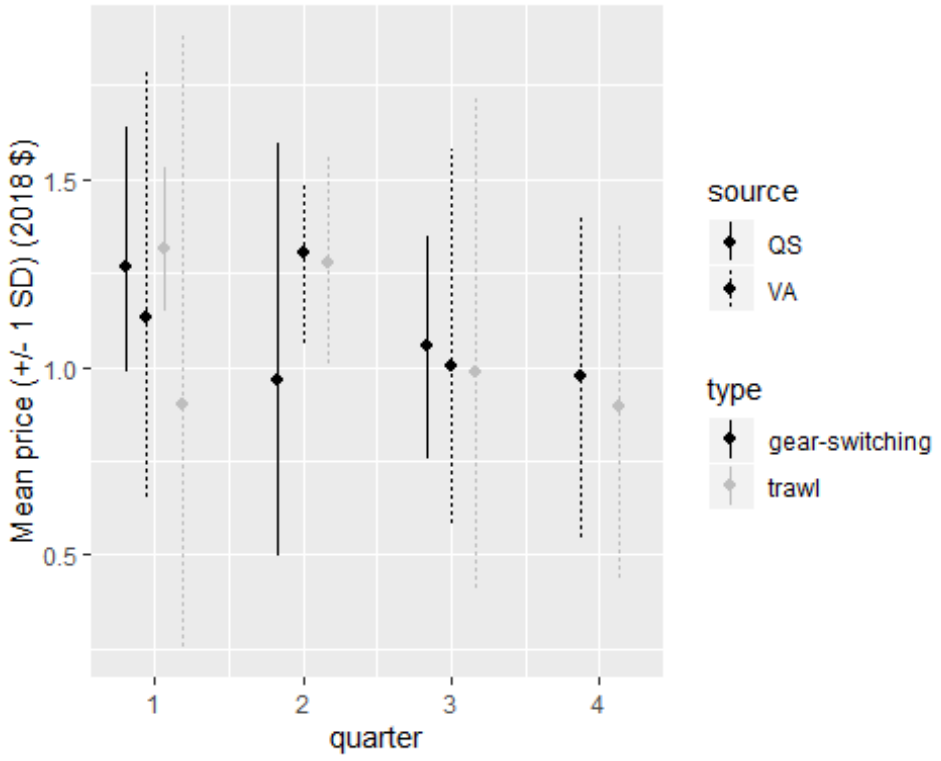

Figure 12. QP prices for purchases by trawl and by gear switching vessels, from QS accounts and from other vessel accounts. (Source: Erin Steiner, NWFSC, Sept 24, 2019)

Seasonality of QP Trading

Information on the seasonality of QP trading may be relevant to Alternative 1 for which all trawl-only QP would convert to unrestricted QP sometime between mid-summer or early fall. At the start of each year there are a large number of QP transactions as QP are transferred from QS accounts to vessel accounts (Figure 13). As the year progresses, QP transfers between vessel accounts become more important. In the first year of the program, 50 percent of the QP transfers between vessel accounts occurred after the end of September (Figure 14). That mark was reached earlier each year, through 2014, when 50 percent of those transfers occurred after the end of June (at the half-way mark for the year). Since then, the trend has reversed and 50 percent of the transfers have occurred later each year, with the 50 percent mark being reached at the end of August in 2018 (as in 2012). In general, QP trading between vessel accounts tends to be higher later in the year than earlier, indicating the possibility that the QP market is more active later in the year (Figure 15).

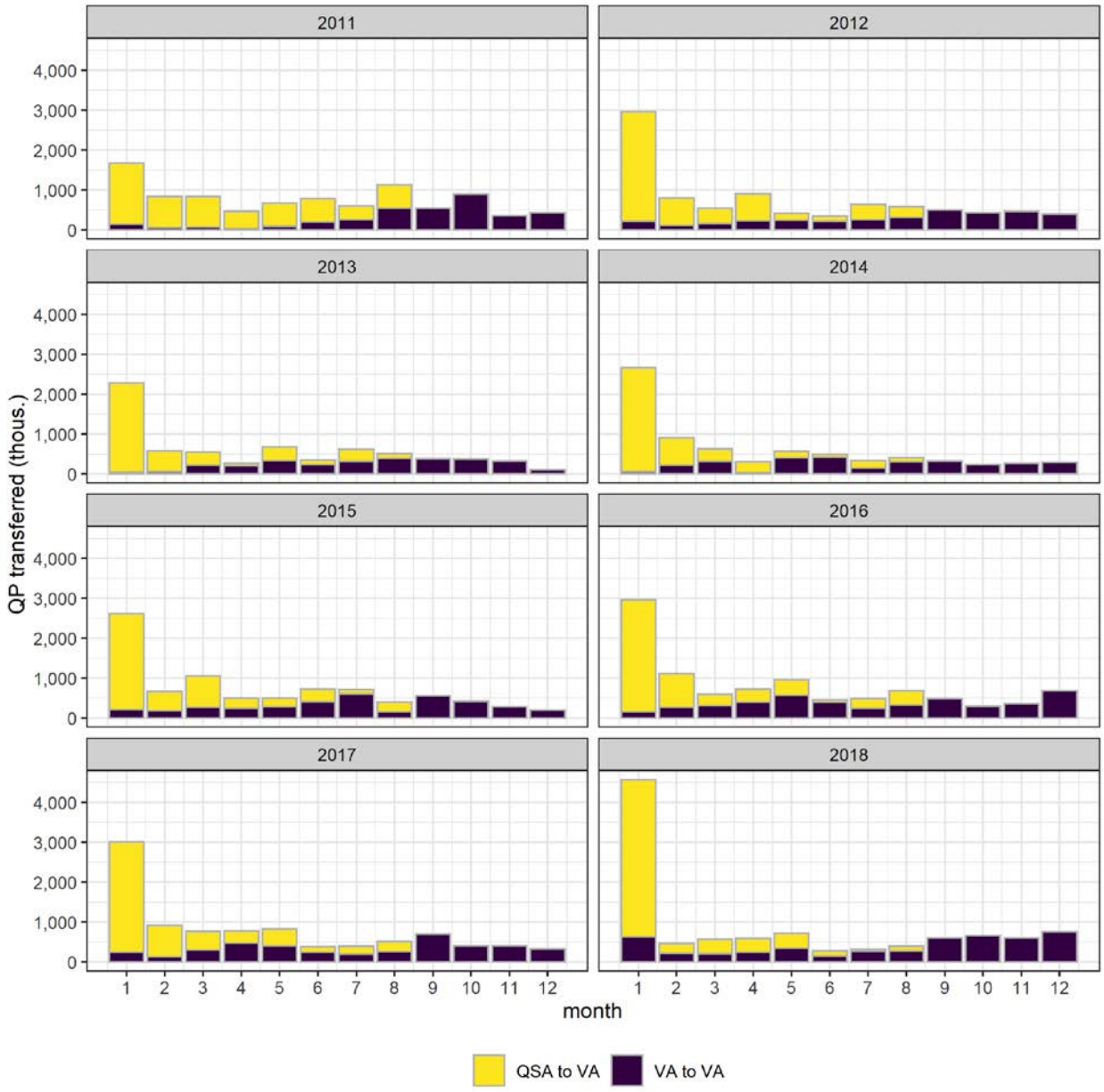

Figure 13. QPs transferred by month from QSA to VA and VA to VA (2011-2018).

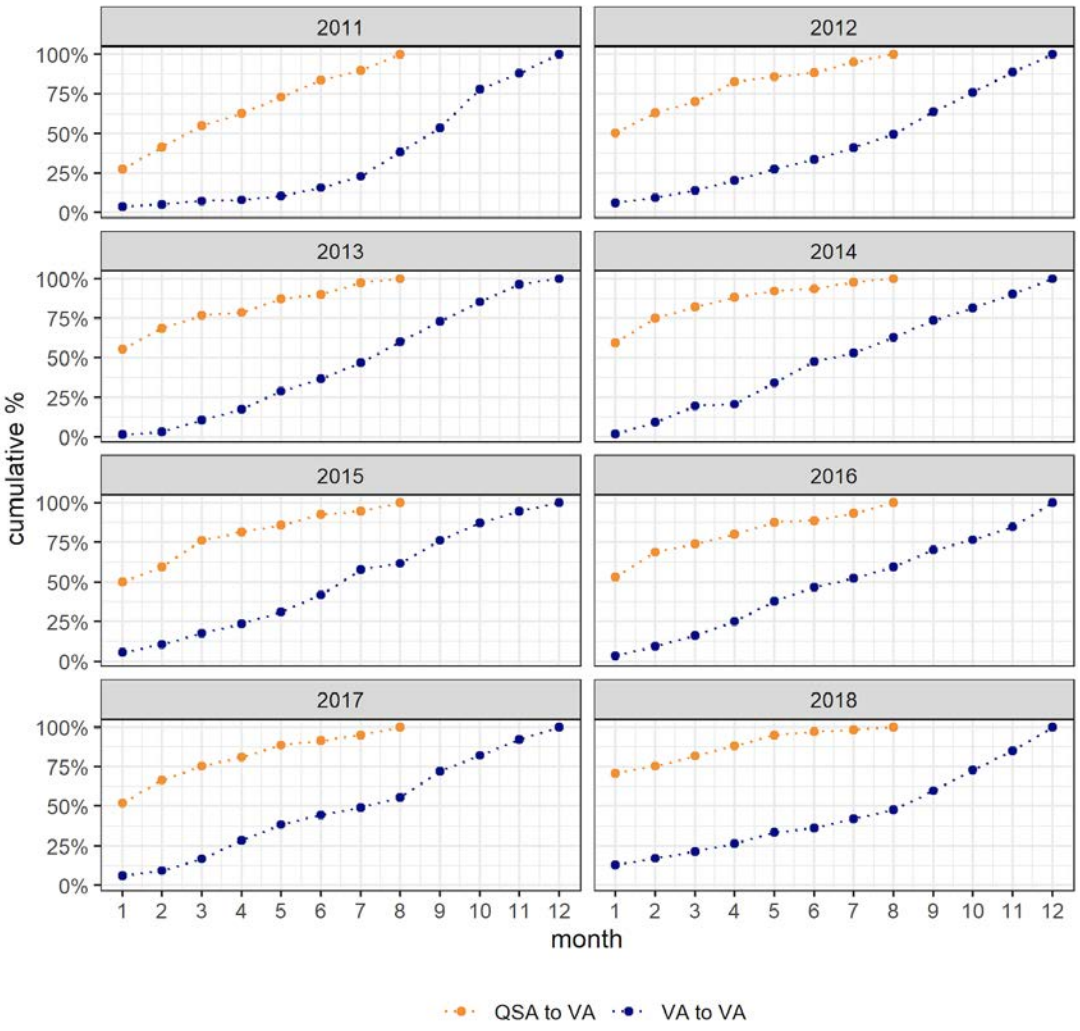

Figure 14. Cumulative percent of QP transfers from QS accounts to vessel accounts and between vessel accounts by month. (Internal Reference File: Monthly-QP-transfer-EDA.html, from CBN)

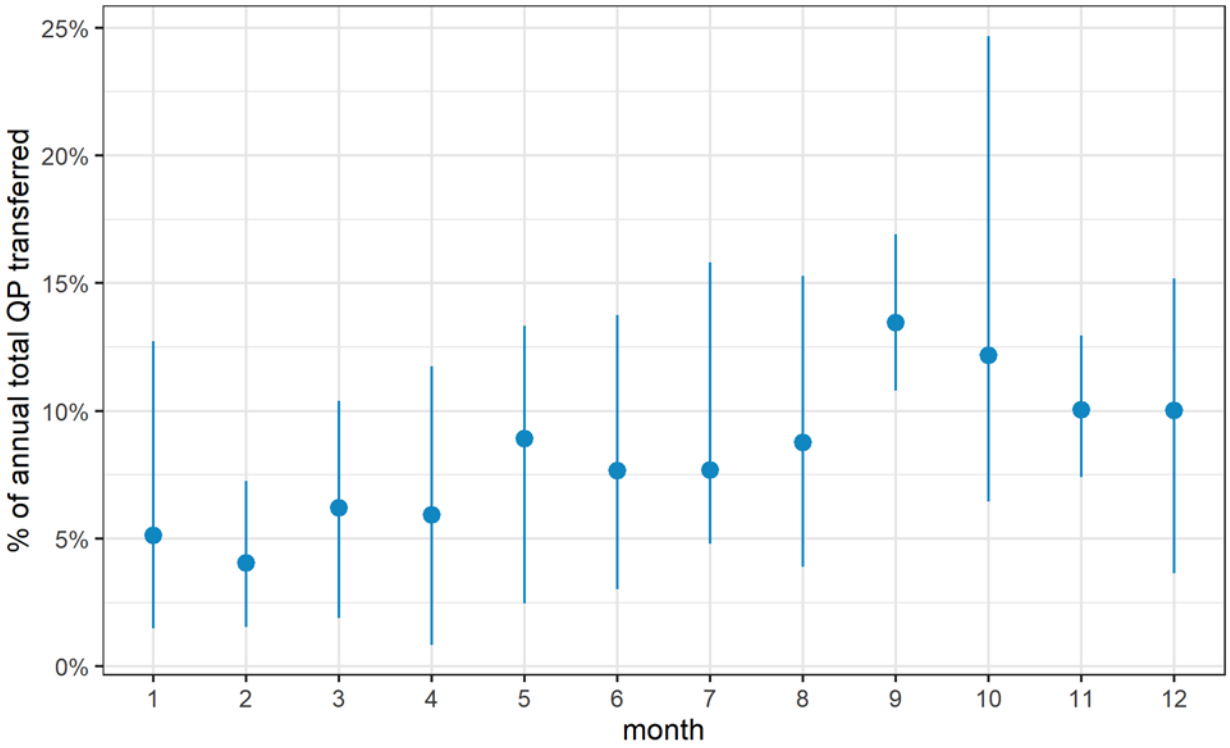

Figure 15. Average percent of annual total quota pound transferred between vessel accounts each month, displayed with lines indicating maximum and minimum values for each month (2011-2018). (Internal Reference File: Monthly-QP-transfer-EDA.html, from CBN)

Communities

Section Summary: Importance of sablefish to West Coast communities. Limitations or elimination of gear switching of sablefish north may have significant impacts on certain communities. From 2011-2018,

- *Newport has seen the greatest overall amount of sablefish landed and percentage of total revenue by IFQ fixed gear*
- *Astoria has seen the greatest overall amount of trawl sablefish landed and percentage of total revenue*

While changes to the gear switching provisions may affect individual vessels, permit holders, or QS owners, there would likely be additional effects to the communities in which those participants reside. Table 14 below shows the total coastwide sablefish landings and revenue from sablefish landings by sector and gear (IFQ trawl, IFQ-fixed gear, and non-IFQ). Note that all non-groundfish sector and tribal landings of sablefish are included in the "non-IFQ" sector, but retained at-sea bycatch is not included. Due to confidentiality, some sectors and areas were combined. For sector combinations, staff initially combined IFQ landings to meet the "rule of 3" and then, if that was not sufficient to ensure confidentiality, combined all landings and revenue together for a specific port group.

Overall, the most landings of fixed gear sablefish in the IFQ program are into Newport, with 4.11 percent of the total coastwide landings since 2011, followed by Astoria (which also had the highest percentage of trawl sablefish landings). For non-IFQ landings, the North Washington Coast/Puget Sound area saw the highest percentage of coastwide landings over the eight-year time period. Looking at revenue, ports with the highest percentage of revenue sectors/area from non-IFQ fixed gear sablefish were North Washington Coast/Puget Sound, Newport, and the South and Central WA coast. For the IFQ sectors specifically, Astoria and Newport have historically seen the highest percentage of their revenue from sablefish north landed in the IFQ sector by trawl and fixed gear, respectively.

Table 14. Number of Vessels, Dealers, Landings (rd. wt. mt) and revenue (millions of $) from sablefish coastwide, 2011-2018 by IOPAC port group and sector ("non-IFQ" includes both groundfish and non-groundfish sectors).

IOPAC Port Group	Sector	Number of Vessels	Number of Dealers	Landings (mtons)	Landings As Percentage of Total Port Landings	Revenue (Millions of $)	Revenue As Percentage of Total Port Revenue
North WA Coast/Puget Sound	IFQ	16	4	387.9	0.93%	$2.62	1.11%
	NON-IFQ	56	45	4811.8	11.57%	$32.24	13.64%
South and Central Washington Coast	IFQ FG	10	6	977.9	2.35%	$6.11	2.58%
	NON-IFQ	104	29	2819.0	6.78%	$19.28	8.16%
	IFQ TRAWL	17	4	508.6	1.22%	$2.11	0.89%
Astoria	IFQ FG	13	5	1503.9	3.62%	$9.73	4.12%
	NON-IFQ	47	12	683.3	1.64%	$4.79	2.03%
	IFQ TRAWL	45	5	3100.5	7.45%	$12.73	5.39%
Tillamook	NON-IFQ	12	9	21.3	0.05%	$0.12	0.05%
Newport	IFQ FG	12	7	1710.6	4.11%	$11.22	4.75%
	NON-IFQ	103	29	2668.0	6.41%	$20.09	8.50%
	IFQ TRAWL	30	6	1891.2	4.55%	$8.02	3.39%
Coos Bay	IFQ FG	5	3	261.9	0.63%	$1.80	0.76%
	NON-IFQ	80	24	1444.0	3.47%	$11.11	4.70%
	IFQ TRAWL	23	3	1480.4	3.56%	$5.40	2.28%
Brookings	IFQ	14	4	1452.0	3.49%	$6.56	2.78%
	NON-IFQ	68	12	1293.0	3.11%	$8.09	3.42%
Crescent City	NON-IFQ	12	18	341.9	0.82%	$1.90	0.81%
	IFQ TRAWL	7	3	104.4	0.25%	$0.48	0.20%
Eureka	NON-IFQ	56	18	597.6	1.44%	$3.93	1.66%
	IFQ TRAWL	12	7	1870.5	4.50%	$8.75	3.70%

Table 10. Cont.

IOPAC Port Group	Sector	Number of Vessels	Number of Dealers	Landings (mtons)	Landings As Percentage of Total Port Landings	Revenue (Millions of $)	Revenue As Percentage of Total Port Revenue
Fort Bragg	IFQ	9	5	1368.1	3.29%	$5.83	2.47%
	NON-IFQ	105	47	2190.8	5.27%	$9.70	4.10%
Bodega Bay	ALL	52	38	531.8	1.28%	$3.71	1.57%
San Francisco	IFQ FG	7	8	344.0	0.83%	$1.42	0.60%
	NON-IFQ	98	88	527.2	1.27%	$4.04	1.71%
	IFQ TRAWL	9	14	113.6	0.27%	$0.34	0.15%
Monterey	IFQ FG	7	7	192.7	0.46%	$0.45	0.19%
	NON-IFQ	103	42	933.7	2.24%	$4.09	1.73%
	IFQ TRAWL	4	11	166.2	0.40%	$0.63	0.27%
Morro Bay	IFQ FG	19	17	1326.0	3.19%	$6.53	2.76%
	NON-IFQ	75	44	1576.1	3.79%	$8.21	3.47%
	IFQ TRAWL	3	7	61.7	0.15%	$0.25	0.11%
Santa Barbara	ALL	77	79	1486.9	3.57%	$9.14	3.86%
Los Angeles	NON-IFQ	48	33	331.2	0.80%	$2.02	0.85%
San Diego	NON-IFQ	42	37	523.2	1.26%	$2.89	1.22%

While the table above provides some context around where sablefish landings occur and overall dependence coastwide, the alternatives in front of the SaMTAAC are focused purely on sablefish north. To look at the dependence of communities on sablefish north of 36° N. lat. more closely, Figure 16 below shows the relative amount of landings of sablefish north by IOPAC group by sector (IFQ-trawl, IFQ-fixed gear, and non-IFQ) across 2011-2018. As in the table above, non-IFQ includes both commercial and tribal landings. The size of the bubble shows the relative amount of landings in that port group and sector compared to the other port groups and sectors. South and central Washington, Astoria, Newport and Brookings have seen the largest relative landings across each of the sectors over the last eight years. The farther south the port is (to the right on the x-axis), there are fewer overall relative landings of sablefish north into those ports.

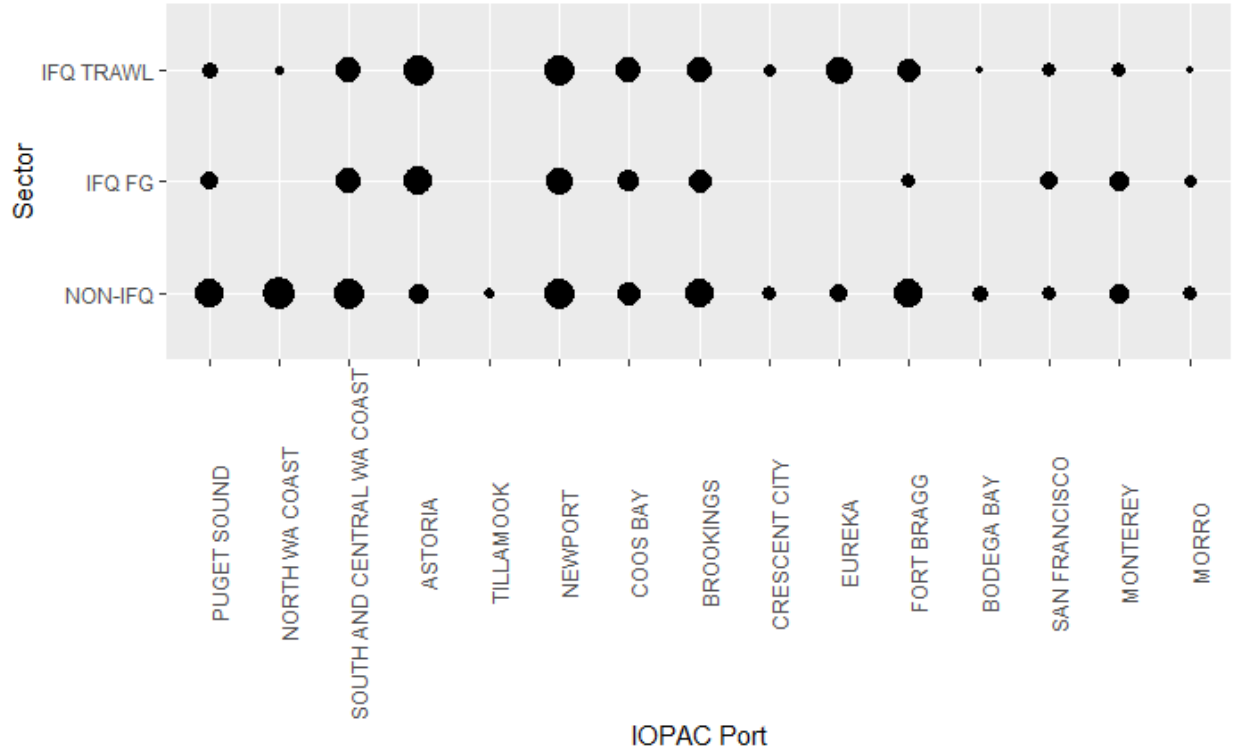

Figure 16. Relative landings by port group and sector of sablefish north from 2011-2018.

Analysis Applying Across Several Alternatives

Section Summary: This section starts with a series of analyses that may have a bearing on the degree to which the Council might or might not want to limit gear switching. The sections following that delve into issues related to decisions allocating among specific fishermen, beginning with a short review of Magnuson-Stevens Act (MSA) guidance on initial allocation. This is followed by a review of allocation choices made in past groundfish limited access programs recommended by the Council, the entities the Council chose to evaluate for initial allocations, and some of the central rationale for those choices. Following these general sections

on allocation, are sections with information related to the consideration of allocation based on three types of entity: the vessel, the LE permit and the QS account, along with analysis of specific qualification requirements that may applied to different alternatives.

Impact Information Related to Amounts of Gear Switching Allowed

Geographic Distribution of Gear Switching

Section Summary: This section describes the geographic distribution of changes that might occur if gear switching were eliminated (at this point no alternative proposes the total elimination of gear switching but options in Alternative 3 might move a long way in that direction). Gear switching is not evenly distributed among ports and capping, reducing, or eliminating gear switching would affect ports differently depending on the degree to which trawling expands in response to the limitation and the distribution of the trawl activity along the coast. Here we take a first step in looking at this issue by examining the percent reduction in port ex-vessel revenue that would be expected from eliminating gear switching, but without taking into account the potential compensating response in the trawl sector.

- *South and central Washington, Newport, and Astoria are likely to be the most impacted by a reduction or elimination of gear switching of sablefish north.*
- *Coos Bay, Brookings, and San Francisco have seen years with over 30 percent of the total groundfish revenue in that port coming from fixed gear sablefish.*

Some of the alternatives under consideration by the SaMTAAC would result in minimizing or potentially eliminating the use of fixed gear for harvesting sablefish north of 36° N. lat. To provide a sense of the economic impacts by community if gear switching were eliminated, the following table shows the percent reduction in groundfish revenue in 2011-2018 by year if gear switched sablefish north was not landed into those ports (Table 15). While this does not consider any additional revenue that could be brought into various ports with additional trawling (or from other fisheries), it does provide a picture of which port/port groups may be impacted the hardest by a reduction or elimination of gear switching of sablefish. Note, there were 45.2 mt of non-sablefish groundfish with an associated $441,895.70 in ex-vessel revenue across the eight years that were removed from this analysis because there was not a corresponding IOPAC port code due to state data issues.

The percentage of revenue that IFQ fixed gear sablefish north brings into dealers varies by port and year. Some port groups, like Newport and the South/Central Washington Coast, have seen IFQ fixed gear landings across all eight years at different levels. Others, like Brookings, have only seen gear switched sablefish north landings in a few years. Depending on the markets and other fishing opportunities, the reduction or elimination of fixed gear sablefish landings in the IFQ sector could be significant to a port group. While there could be additional opportunities for

trawl landings with additional sablefish, some of these ports may not have the infrastructure to process trawl caught groundfish.

Table 15. Percentage reduction in total groundfish revenue by IOPAC port group by year if IFQ fixed gear landings of sablefish north were not permitted. "-" represents no change as there were no IFQ fixed gear landings of sablefish north into dealers in that port group in that year.

IOPAC Port Group	2011	2012	2013	2014	2015	2016	2017	2018
Puget Sound	16.70	18.39	-	7.79	40.41	21.24	38.54	6.91
North WA Coast	-	-	-	-	-	-	-	-
South and Central WA Coast	36.56	15.53	9.80	42.92	5.06	16.47	12.80	8.72
Astoria	3.53	44.85	8.45	3.54	13.77	15.81	10.45	26.69
Tillamook	-	-	-	-	-	-	-	-
Newport	49.66	35.49	8.91	0.41	15.28	34.57	22.03	19.18
Coos Bay	4.04	1.31	3.49	-	1.39	52.16	25.92	3.46
Brookings	-	-	-	37.23	6.30	-	-	0.35
Crescent City	-	-	-	-	-	-	-	-
Eureka	-	-	-	-	-	-	-	-
Fort Bragg	4.36	2.15	0.77	1.95	1.51	1.55	2.06	-
Bodega Bay	-	-	-	-	-	-	-	-
San Francisco	15.94	4.30	4.03	34.96	12.53	4.86	10.56	-
Montetery	14.18	4.11	-	-	0.30	-	3.94	6.66
Morro Bay	2.40	0.43	-	8.15	14.80	9.18	6.85	-

a/ There were no landings of sablefish north into the IOPAC port groups of Santa Barbara, Los Angeles, or San Diego and are therefore not reported in this table.

Impact of Gear Switching on Attainment of Other Species

Section Summary: One of the main concerns with gear switching might be that it is impacting attainment of other IFQ species, specifically Dover sole and thornyheads. This section attempts to characterize those potential impacts and some effects that might be expected from a hypothetical elimination of gear switching.

- *It would take 3.75x the 2020 sablefish north shorebased IFQ allocation to catch the entire 2020 Dover sole IFQ allocation at the current average catch ratio of Dover sole to sablefish*
- *If a 10:1 Dover sole: sablefish ratio were achieved and all sablefish had been taken with trawl gear, attainment in 2016-2018 could have increased to 45-50% (*Table 18*)*
- *If gear switching were not allowed and all the additional sablefish is used in the DTS fishery, just over 4 million dollars of additional exvessel revenue might be generated under current catch shares ratios (assuming markets could absorb the additional fish without impacting prices).*

In May, the SaMTAAC was presented with an update of the catch share review analysis of the hypothetical amount and utilization of three species (Dover sole, shortspine thornyhead, and longspine thornyhead) if all sablefish were to be taken with trawl gear.[7] There were a few questions regarding the calculations that were not able to be answered until after the May SaMTAAC meeting. A summary of that analysis, with additional details, is provided here.

Figure 17 below shows the ratio of dover sole to sablefish catch on non-whiting trawl trips from 2011-2017 based on WCGOP haul level data. Since 2015, when the Dover sole ACL was increased to 50,000 mt, the catch ratio has averaged 4:65:1 (based on 2015-2017 data) compared to the 4:95:1 ratio (based on 2011-2015 data) that was used in the five-year review document. Assuming the more recent catch average ratio, it would take 21,799,308 lbs of sablefish (9,888 mt) to take the entirety of the 2020 Dover sole IFQ allocation. That is 3.75 times the amount of the 2020 shorebased IFQ allocation for sablefish north.

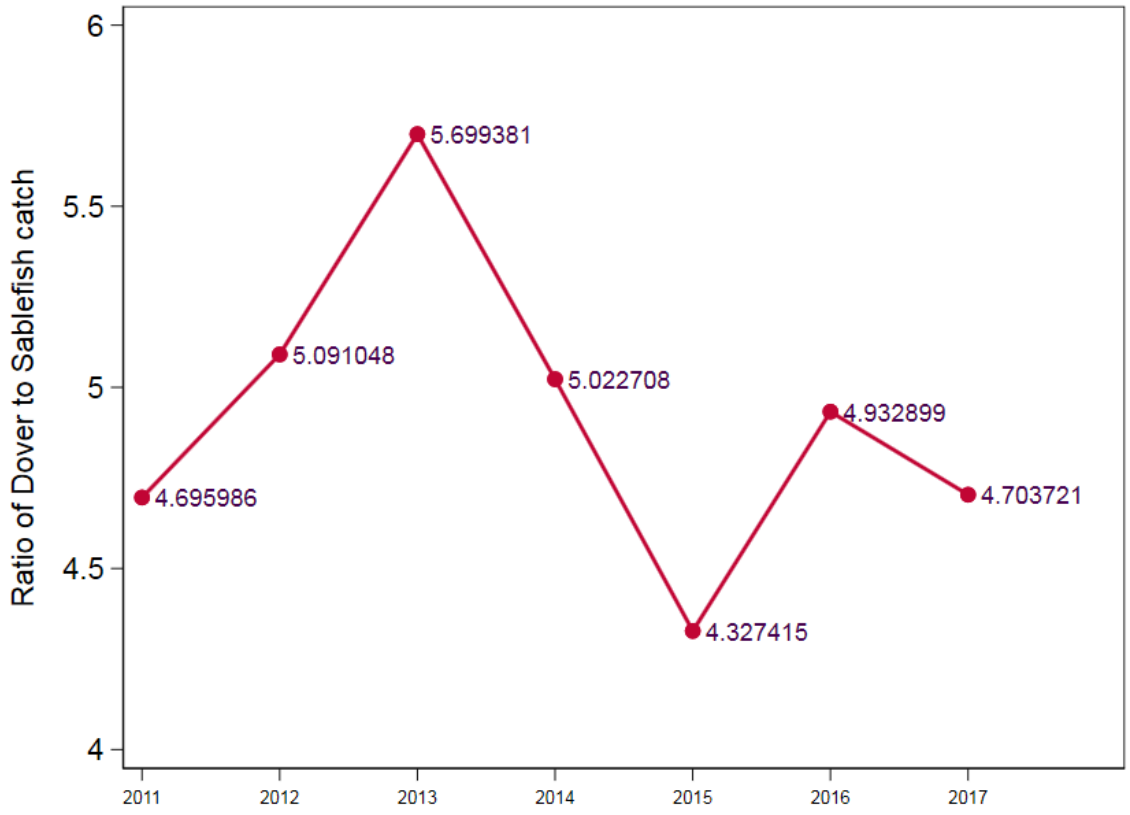

Figure 17. Ratio of dover sole to sablefish catch (including discards) for non-whiting trawl hauls, 2011-2017.

[7] PFMC and NMFS. 2017. West Coast Groundfish Trawl Catch Share Program: Five-year review. Approved by the Pacific Fishery Management Council November 16th 2017, Costa Mesa, CA.

Looking at the potential utilization of Dover sole and thornyheads if all sablefish were caught with trawl gear. Table 16 below shows the actual utilization of each species for 2011-2014 (before the Dover sole ACL increase) and 2015-2017(after the Dover sole ACL increase), and then a lower and upper bound based on the pre-catch shares (2006-2010) and a post-catch shares implementation (2011-2017) ratio of co-occurring species catch to sablefish catch. The bounds were calculated as follows:

> Lower bound: (Total IFQ sablefish catch (trawl and fixed gear) in year Y * (2006-2010 average ratio of species X to sablefish))/ IFQ allocation of species X in year Y
>
> Upper bound: Total IFQ sablefish catch (trawl and fixed gear) in year Y * (2011-2017 average ratio of species to sablefish))/ IFQ allocation of species X in year Y

For Table 16 below, these bounds, in addition to the actual utilization percentages, were averaged over the two eras- 2011-2014 and 2015-2017.

Table 16. Actual average utilization of Dover sole, longspine thornyhead, and shortspine thornyhead and lower and upper bounds of hypothetical utilization based on pre-IFQ and post-IFQ implementation catch ratios of species to sablefish north and assumption that all of sablefish north was caught with trawl gear for 2011-2014 and 2015-2017

Species	2011-2014			2015-2017		
	Actual Utilization	Lower bound of hypothetical utilization	Upper bound of hypothetical utilization	Actual Utilization	Lower bound of hypothetical utilization	Upper bound of hypothetical utilization
Dover sole	32.8	32	45.7	15	17.9	25.5
Longspine thornyhead	48.3	48.3	64.1	25.6	37.5	49.8
Shortspine thornyhead	51.6	52.5	73.1	45.6	54.4	75.8

The author notes that both bounds are unrealistic because they are calculated using a catch ratio that does not reflect reality of the full sector allocation going to trawl gear under an IFQ system.

If the IFQ era ratio of 4.65:1 were to continue, elimination of gear switching would result in a hypothetical 24.5 percent attainment of the 2020 allocation of Dover sole (4.65 * 2020 sablefish north IFQ allocation/2020 Dover sole IFQ allocation). For perspective, in 2018, the percent attainment for Dover sole was 12.7 percent in the IFQ sector.

While there is uncertainty around how much trawlers could and would increase their Dover sole to sablefish ratios in order to increase overall attainment of Dover sole, some members of the SaMTAAC were interested in what the potential impacts of a 10:1 ratio of Dover sole to sablefish would be.

Given that the average ratio of Dover sole to sablefish north catch is 4.65:1 for non-whiting trawl trips from 2015-2017, staff examined WCGOP haul level data to assess if a 10:1 ratio is currently being fished and how often. Table 17 below looks at the WCGOP level haul data from 2011-2018 on bottom trawl trips that had at least 1 lb of sablefish north on the haul. For most years, between 30 and 40 percent of all sablefish north positive bottom trawl hauls had a Dover sole: sablefish ratio of 10:1 or greater. While it is still uncertain to what degree trawlers could and would increase their ratio if there were a limitation or elimination on gear switching, it does show that a higher Dover sole to sablefish ratio is possible.

Table 17. Number and percentage of total hauls by bottom trawl vessels with at least 1 lb of sablefish north that exhibited a ratio of Dover sole to sablefish catch of 10:1 or greater or less than 10:1, 2011-2018.

Year	Ratio	Hauls	Percentage of Hauls
2011	10:1 or greater	2484	33.20
	Less than 10:1	4997	66.80
2012	10:1 or greater	2467	35.41
	Less than 10:1	4500	64.59
2013	10:1 or greater	3077	39.67
	Less than 10:1	4679	60.33
2014	10:1 or greater	2283	36.45
	Less than 10:1	3981	63.55
2015	10:1 or greater	1957	34.23
	Less than 10:1	3761	65.77
2016	10:1 or greater	2054	41.10
	Less than 10:1	2944	58.90
2017	10:1 or greater	1935	37.73
	Less than 10:1	3193	62.27
2018	10:1 or greater	1589	36.44
	Less than 10:1	2771	63.56

Table 18 below provides a yearly look at 2016-2018 actual catches of Dover sole and sablefish north in millions of pounds as well as the hypothetical pounds and percent attainment based on the 4.65:1 ratio from above as well as the 10:1 request by the SaMTAAC. As shown, under the

10:1 ratio, with elimination of gear switching, hypothetical percent attainment could increase by 3-4 times compared to actual percent attainment.

Table 18. Actual Dover sole available and used QPs (millions of lbs), sablefish north QPs (millions of lbs), and Dover sole percent attainment for 2016-218 and projected dover QPs (millions of lbs) and percent attainment based on a 4.65:1 and 10:1 ratio and assuming that all sablefish previously used by the fixed gear IFQ vessels is instead used to harvest DTS.

Year	Actual				4.65:1 Ratio		10:1 Ratio	
	Dover Available Lbs	Dover QPs Used	Sablefish N QPs Used	Percent Attain.	Projected Dover QPs	Projected Percent Attain.	Projected Dover QPs	Projected Percent Attain.
2016	110.67	15.86	5.07	14.33%	23.58	21.30%	50.70	45.81%
2017	110.91	16.20	5.57	14.60%	25.92	23.37%	55.75	50.27%
2018	111.06	14.05	5.09	12.65%	23.65	21.29%	50.86	45.79%

Using the same ratios and time from Table 18, Table 19 shows the projected revenue from Dover sole that would result from the two ratios compared to actual data from 2016-18. If all the sablefish that were caught in each year were landed with trawl gear under the 4.65 ratio, it would result in an additional $3.99-$4.33 million in ex-vessel revenue. For the 10:1 ratio, it would be over $16 million in additional revenue from Dover sole alone. This would not take into account any revenue from additional co-occuring species, such as thornyheads but also assumes that the markets would be able to absorb the additional product without impacting price.

Table 19. Projected revenue (millions of $) under a 4.65:1 and 10:1 ratio of Dover sole to sablefish assuming that all sablefish landed in each year were caught with trawl gear, 2016-2018

Year	Actual		4.65:1 Ratio			10:1 Ratio		
	Average Price per Lb	Revenue (Millions $s)	Projected QPs (Millions)	Projected Revenue	Difference from Actual	Projected QPs (Millions)	Projected Revenue	Difference from Actual
2016	$0.46	$6.85	23.58	$10.84	$3.99	50.70	$23.32	$16.47
2017	$0.42	$6.86	25.92	$10.89	$4.02	55.75	$23.41	$16.55
2018	$0.44	$6.07	23.65	$10.41	$4.33	50.86	$22.38	$16.30

As shown in Table 2 above, fixed gear caught sablefish land a higher price per pound than trawl caught sablefish and get a higher price per pound than the other DTS species (shown below in Table 20). Table 21 shows the 2016-2018 ex-vessel revenue in millions of dollars from bottom trawl trips for all of the DTS species (north of 36° N. lat. only) compared to the fixed gear sablefish revenue in that year. While fixed gear sablefish typically takes around 30 percent of the available quota (and approximately 30-55 percent of what trawl gear harvests), it produces at least 80 percent of the revenue that trawl sablefish or Dover sole does, with fewer pounds.

Table 20: Average price per pound for dover sole, shortspine, and longspine thornyhead, 2016-18.

Year	Dover	Shortspine	Longspine
2016	$0.46	$0.79	$0.44
2017	$0.42	$0.70	$0.48
2018	$0.44	$0.59	$0.42

Table 21. Ex-vessel revenue (millions of $s) from bottom trawl trips in 2016-18 from sablefish N, dover sole, shortspine thornyhead, and longspine thornyhead and fixed gear sablefish north.

Year	Bottom Trawl				Fixed Gear
	Sablefish Revenue	Dover Revenue	Shortspine Revenue	Longspine Revenue	Sablefish Revenue
2016	$6.58	$6.85	$1.26	$0.64	$5.49
2017	$6.95	$6.86	$1.14	$0.83	$5.71
2018	$4.09	$6.07	$0.77	$0.31	$4.08

If bottom trawlers were able to catch the landings hypothesized under the 4.65:1 ratio assuming all sablefish catch was by trawl gear (Table 19), the revenue from the additional bottom trawl vessel harvest of would of Dover sole alone could be equal to 70.4 to 106.1 percent of the revenue loss from fixed gear sablefish landings, again this assume the markets can absorb the volume without a reduction in price. If they were able to increase the ratio to 10:1, the resulting revenues could far exceed the amount of revenue from fixed gear sablefish north. The fact that these potential revenue increases are theoretically possible under the current system brings back the question of what is constraining the development of markets for Dover and other co-occurring species.

Impact of Gear Switching on Stock Productivity

As was noted in Section 4.0 of the May SaMTAAC analysis, there was an analysis of the impacts of gear switching on the sablefish stock in 2011 which was unable to be updated until the conclusion of the 2019 sablefish stock assessment. The analysis looked at impacts to the stock assuming that 100 percent of the trawl allocation was taken with fixed gear compared to if 100 percent was taken with trawl gear. In 2011, under the base case, the preliminary conclusion was that there was little difference in the depletions of the two catch scenarios. Working with the 2019 sablefish stock assessment team (STAT), this analysis was redone using the 2019 base case and produced similar results. Table 22 shows the 10-year projections for spawning biomass and depletion under the base case (P*=0.40,40:10 adjustment, full ACL removals north and south).

Table 22. Ten year projections under the 2019 sablefish stock assessment base case (P*=0.40, 40:10 adjustment, full ACL removals) under two scenarios: 100 percent fixed gear catch from 2019 forward and 100 percent trawl gear catch from 2019 forward.

	All Fixed Gear Catch from 2019 forward		All Trawl Catch from 2019 forward	
Year	Spawning Biomass	Depletion	Spawning Biomass	Depletion
2019	57,444	38.9%	57,444	38.9%
2020	63,009	42.7%	64,180	43.4%
2021	67,490	45.7%	69,636	47.1%
2022	67,856	45.9%	71,070	48.1%
2023	67,066	45.4%	71,025	48.1%
2024	66,297	44.9%	70,608	47.8%
2025	65,806	44.5%	70,163	47.5%
2026	65,565	44.4%	69,779	47.2%
2027	65,499	44.3%	69,472	47.0%
2028	65,545	44.4%	69,236	46.9%
2029	65,657	44.4%	69,059	46.7%
2030	65,814	44.6%	68,937	46.7%

While there is a slight difference (~2 percent) in the terminal year depletion, this is well within the uncertainty of the model and the STAT team does not believe there is any significant differences between the two scenarios. Additionally, this assumes that the entire IFQ sablefish allocation (north and south) is taken with trawl or fixed gear. Given that southern sablefish is predominantly harvested by fixed gear, has low attainment in recent years, and there are no SaMTAAC alternatives currently under consideration that would alter the status quo behavior, the resulting depletions under a scenario where south is unchanged and the north is 100 percent trawl would likely be closer to the 100 percent fixed gear scenario.

Significance of End-of-Year Unused QP

Section Summary: Discussion of a future analysis that might be helpful.

There is some level of under attainment of allocations in many IFQ fisheries. The degree of under attainment depends to some degree on the specific design of the program. For example, the blocked quota in the North Pacific Fishery Management Council sablefish program may contribute to the underattainment of quota in that fishery (rather than being divisible, some quota is blocked together and must be traded in units). Additionally, just as there is structural unemployment in the general economy, there may be some level of under attainment of QP in this fishery that will usually be present. This may be due to factors like the cost of sweeping up small amounts of QP so that enough can be gathered for a single trip or the presence of the the opportunity to carryover amounts of unused QP from one year to the next.

Depending on priorities and time available an analyses that might be provided here would assess the degree of quota underattinament in other IFQ fisheries might help understand the performance of the West Coast fishery. However, such an assessment would require not only examination of the underattainment levels but also an exploration of the program provisions that might be impacting those results.

One thing that can be examined is the relationship between surplus QP carryover opportunities and unused sablefish QP. Table 23 shows the percentage of available QPs of sablefish north that went unharvested in a given year and the percentage of that year's available QPs that were issued as surplus carryover in the following year. As a reminder, carryover is the cumulative total of QPs in a vessel account in the base year (used or unused) minus any transfers or previous carryover amounts. In 2018, there was 10.26 percent of QPs left unharvested, but the Council and NMFS chose to issue carryover in 2019 that amounted to 4.42 percent of the 2018 total available QPs. Some of this difference might be attributed to individual accounts that had an amount of unused sablefish QP in excess of the 10 percent carryover limit. In general, QP eligible for carryover makes up over half the total amount of unharvested QP. On that basis, it is reasonable to hypothesize that at levels of attainment above 90 percent, the ability to carryover unused QP may be the cause of underattainment of the northern sablefish QP allocation, rather than the existence of a surplus of QP that no one would be able to use. The only year where carryover was greater than the percentage of unharvested QPs was in 2017. A carryover greater than the unharvested QP is able to occur because unharvested QP for the sector is determined taking into account both deficits and surpluses while carryover amounts are determined by looking only at those accounts with surplus QP. In 2017, there was record high bycatch in the whiting sector and the trawl and fixed gear sectors both saw high prices and attainment overall (Table 1,Table 2).

Table 23. Percentage of Available QPs Unharvested and the Percentage of Available QPs issued as carryover in the following year.

Year	Unharvested QPs	Carryover Issued (percent of available QPs carried over to the subseqent year)
2011	5.81%	0.00%
2012	9.39%	4.72%
2013	4.82%	3.31%
2014	8.19%	4.39%
2015	3.76%	2.82%
2016	7.11%	5.70%
2017	1.12%	1.90%
2018	10.26%	4.42%

Impact of Gear Switching on QP Markets for Sablefish and Other Species

Section Summary: The committee requested an analysis on the impact of gear switching on the QP markets for other species which has not yet been developed and may be somewhat difficult given the newness and lack of full understanding of the QP markets. It is speculated here that limiting gear switching is unlikely to impact the market price for most non-sablefish QP.

Evaluation of these markets and their interaction will require the concerted focus of an econometric analyst. Data on QP trading and transaction prices is still limited and incomplete. To address this question, QP market information likely will have to be developed and combined with an understanding of the cost structures of individual firms.

With respect to non-sablefish QP, if a decrease in gear switching is accompanied by an increase in attainment of those other species, it may have little impact on the QP prices for most of those species because there are currently large amounts of surplus QP. (Non-whiting exceptions might be yellowtail rockfish, widow rockfish and Petrale sole, which are more highly attained. Whiting is also highly attained but unlikely to be impacted by increased availability of sablefish QP due to reduced gear switching).

MSA Allocation Guidance

Section Summary: All of the alternatives include options that would allocate fishing privileges. A summary of the MSA allocation guidance is provided in this section. All of this text (indented) was also provided in the analysis package for the May 2019 SaMTAAC meeting. In addition to considering National Standards such as those covering the need for fairness and equity, the promotion of conservation and ensuring no single entity acquires an excessive share, the guidance also addresses needs to cover current and historical participation in the fishery, employment, and investment, among other factors.

There are a number of MSA requirements related to the allocation of fishing privileges including (but not limited to) National Standard 4, which requires

Text from the analysis provided for the SaMTAAC's May 2019 meeting.

(4) Conservation and management measures shall not discriminate between residents of different States. If it becomes necessary to allocate or assign fishing privileges among various United States fishermen, such allocation shall be (A) fair and equitable to all such fishermen; (B) reasonably calculated to promote conservation; and (C) carried out in such

manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.

Determination of who is allowed to gear switch or not would likely be considered allocating an aspect of the catch share program (a Limited Access Privilege Program [LAPP]). When privileges related to a LAPP are allocated, the MSA requires the Council to consider

> (i) current and historical harvests;
> (ii) employment in the harvesting and processing sectors;
> (iii) investments in, and dependence upon, the fishery; and
> (iv) the current and historical participation of fishing communities;
>
> MSA §303A,(c)(5)(A)

Other considerations include cultural and social framework (including small vessels, fishing communities, and excessive consolidation) and possible inclusion of measures to assist entry level and small vessel owner-operators, captains, crew and fishing communities. Finally, the program should

> (E) authorize limited access privileges to harvest fish to be held, acquired, used by, or issued under the system to persons who substantially participate in the fishery, including in a specific sector of such fishery, as specified by the Council.
>
> MSA §303A,(c)(5)

The initial allocations of the current program have been found to meet these requirements but as these fishing privileges are altered in a manner that affects different participants in different ways, this guidance continues to be relevant.

Choice of Qualifying Entities

Section Summary: This section focuses on the choice of the unit on which to base initial allocation of the gear switching privileges (which are currently available to all participants in the trawl IFQ program). It starts with a review of the history of Council's past decisions on the unit on which the allocation of a fishing privilege would be based (indented text that was provided in the analysis package for the May 2019 SaMTAAC meeting). Currently, the committee is considering allocating based on the vessel, the limited entry permit, or the QS account.

Under its license limitation program, the Council chose to allocate based on vessel history rather than the history of individual fishermen. This helped both to limit the number of permits initially issued and provided a means for entry and exit while the

program was under development (allowing the Council to argue in court that in so doing it had taken into account current participation). For its sablefish tier system and the Amendment 20 IFQ program, the Council allocated based on permit history. It was argued that, as with the vessel, the permit allowed entry and exit during development of the program and that the permit had become the primary asset associated with the fishing privilege (and had no value except to the extent that it conveys such a privilege).

One of the key components in assessing the impacts of the alternatives is the choice of the qualifying entity. In order for a vessel to harvest fish in the IFQ program, it must have a LE permit with a trawl endorsement. Within the shorebased IFQ fishery, there are several different types of participants. There are those that own vessels, a trawl endorsed LE permits, and quota shares, some that own a vessel but lease the permit from another owner and buy quota pounds on the market, those that lease a vessel, permit, and quota share, and several other combinations. Therefore, if there is a new limit on gear switching and an accompanying qualifying requirement for continued gear switching, the choice of qualifying entity is will affect different participants in different ways. The Council's first decision on the entities to which LE privileges would be allocated came under Amendment 6 to its groundfish FMP.

> The Amendment 6 license limitation system was fully implemented in 1994. During development of the program, the Council considered whether to allocate based on this history of the fisherman or the vessel. Amendment 6 limited entry permits were allocated to the current owners of vessels with qualifying history. Using the vessel as the unit for which fishing history was assessed and initial allocations [allowed the Council to develop a policy that accurately anticipated the number of qualifying limited entry permits and] allowed fishermen to move in and out of the fishery during the period of program development with a lesser risk to their investments. Thus, even though there was a 1988 control date, when permits were issued in 1993, they went to the current owners. Fishermen were able to retire and new fishermen enter through the acquisition of a vessel that was likely to qualify. Additionally, once it became clear that vessels would likely be the basis of allocation, with increasing frequency fishermen wishing to acquire a new vessel without leaving the fishery would write sales contracts that reserved the rights to any future permit issued for the vessel based on activity during the time they owned it. By choosing to allocate permits to current vessel owners, the Council took into account recent and historic participation as well as investment in the fishery.
>
> Another, advantage of allocating limited entry permits based on the vessel rather than that of the fisherman was that it reduced the need to consider the various intricacies of ownership history. These intricacies included how to treat catch history when partnerships formed and separated or individuals joined together and left other legal entities that might own a vessel accruing catch history.

For the sablefish fixed gear endorsement, sablefish tier, and IFQ program, rather than the vessel, the Council allocated based on the history of the Amendment 6 limited entry permits. Amendment 6 essentially associated the vessel history with the newly created permits and in doing so established a precedent which the Council chose to follow in these new program. As with Amendment 6, associating the privilege with the asset allowed for entry and exit during the period of time the programs were under development, again taking into account recent participation (permit ownership), historic participation (history of the permit), and investment in the fishery (the amount paid for the permit). With respect to investment, it was noted that while a vessel that did not receive an initial allocation would still have some value, limited entry permits without the associated fixed sablefish harvest rights or trawl catch shares would be substantially diminished in value.

The trawl IFQ program is the first program subsequent to Amendment 6 that allowed the separation of harvest privileges from the permit subsequent to their initial allocation. Individuals holding trawl limited entry permits were issued QS accounts into which NMFS deposited the QS they were allocated.

Qualification Criteria and Potential Gear Switching

Section Summary: All four alternatives under consideration by the SaMTAAC have elements (if chosen) that would have different qualifying requirements for participation in gear switching at the vessel, permit, or QS level. The following series of analyses is intended to provide the SaMTAAC committee members with information and data to support a narrowing of the potential range of qualifying requirement alternatives.

Vessel and Permit Relationships

Section Summary: This section of the analysis looks at the relationship between LE permits and vessels that have been used for gear switching sablefish north between 2011 and 2018. Of the 39 distinct vessels and permits that have gear switched since 2011,

- *32 vessels used only one permit to gear switch;*
- *30 permits were used on only one vessel;*
- *zero combinations of permits and vessels have landed gear switched sablefish in all eight years (three combinations landed in 7 of the 8;* Table 26*); and*
- *there are 14 instances of permit and vessel ownership where the current owner of the permit or vessel would be receive the same allocation whether qualification is based on vessel or permit history and 25 instances where the choice will impact the allocation result for individuals.*

Two of the key questions for the SaMTAAC in considering an endorsement for gear switching north of 36° N. lat. are (1) which entity is used to qualify for an endorsement, and (2) what will the endorsement be attached to (is the vessel or the permit qualified by the fishing activity)? In May, the SaMTAAC agreed that for the alternatives that would create a gear switching endorsement, the existing LE permits would be the entity that would carry the endorsement (similar to previous endorsements), but either the vessel or the permit's historical activity could qualify that permit.

As a reminder, 39 distinct vessels have harvested sablefish with fixed gear since the implementation of the IFQ program. For most of these vessels, only one LE permit was used to gear switch during the eight-year period (2011-2018, Table 24). Only 7 of the 39 gear switching vessels used more than one permit over the eight-year period with fewer than three vessels using multiple LE trawl permits within a year. In other words, fewer than three vessels switched LE trawl permits in the middle of a fishing year.

Table 24. Number of LE trawl permits used by gear switching vessels, 2011-2018.

Number of Permits Used by a Vessel	Number of Vessels
1	32
2	4
3	3

While the table above focused on the number of permits used by gear switching vessels, it is also important to consider the number of permits that have been used on those vessels. Of the trawl endorsed LE permits used for gear switching since 2011, 30 have only been used on one vessel while nine have been on more than one (Table 25).

Table 25. Number of vessels that LE permits have been used for landing fixed gear sablefish N, 2011-2018

Number of Vessels Registered to Permit	Number of Permits
1	30
2+	9

Overall, there have been 49 distinct vessel-permit combinations involved in gear switching from 2011-2018. To further explore how vessels and permits interact, consider the following example and Figure 18 below. In 2011- 2013, GF1234 was used to gear switch on Vessel A (Vessel-Permit Combination #1). Vessel B picked up GF1234 in 2014 and made a few landings of gear

switched sablefish (Vessel-Permit Combination #2). In 2015, Vessel C acquired GF1234 and landed sablefish with fixed gear in each year since (Vessel-Permit Combination #4). Prior to 2015, Vessel C used GF5678, which was not used from 2015-2018 (Vessel-Permit Combination #3). In Table 24 above, Vessels A and B would fall into the "1 permit" category while Vessel C would fall into "2 permit" category. GF1234 would fall into the "2+ vessel" category in Table 25. GF5678 would fall into the "1 vessel" category. Depending on the qualification criteria, GF1234 or GF5678 could be qualified for a gear switching endorsement through landings associated with those permits (across all three vessels for GF1234 or just Vessel C for GF5678). If the vessel was chosen as the qualifying entity with a minimum participation level of 3 years, Vessels A and C may qualify. Vessel C's current permit, GF1234 would then be issued an endorsement and Vessel A's current permit (if applicable) would also receive an endorsement.

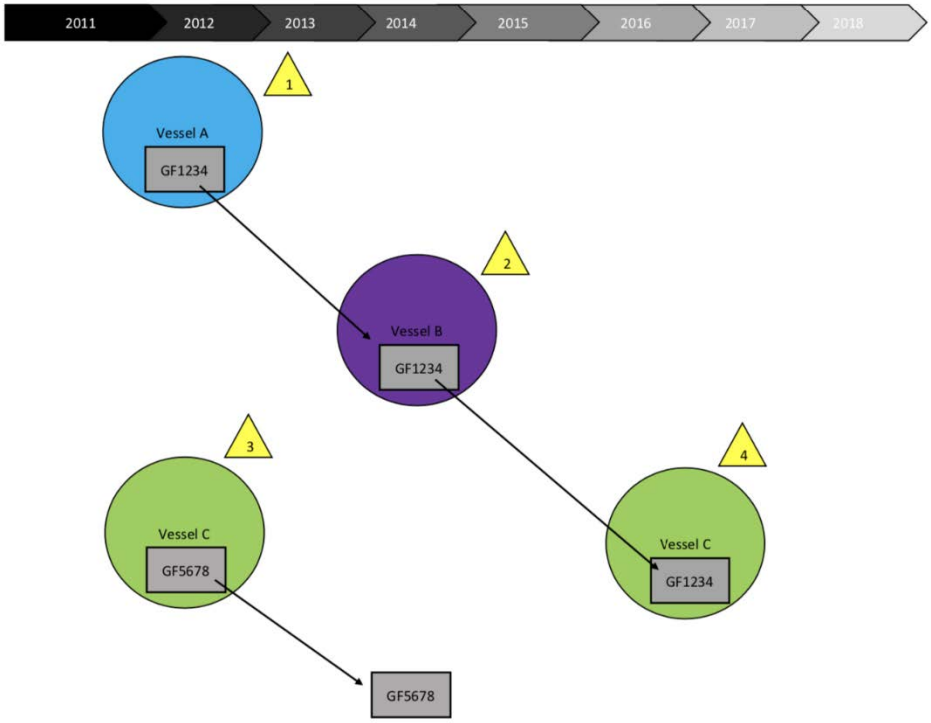

Figure 18. Example of permit-vessel relationships and qualification criteria. Triangles represent a distinct vessel-permit combination, circles represent vessels, and rectangles represent trawl endorsed LE permits.

Of the 49 distinct combinations, there have been zero combinations of vessels and permits used for gear switching sablefish for all eight years (Table 26). There are three unique combinations of vessel-permit that were used for seven years. While these three vessels did actively gear switch in every year since 2011, there was at least one year for each vessel in which a different permit was used.

Table 26. Number of distinct vessel-permit combinations and duration of use.

Years	1	2	3	4	5	6	7
Permit-Vessel Combinations	23	12	3		8		3

The movement of permits among vessels may be the result of ownership changes or leasing arrangements which may or may not be affected differently by the choice to allocate based on permit or vessel history. The following summary evaluates leasing and transfers for the 39 vessels and 39 permits that have some gear switching history without regard to whether or not they would qualify under a requirement that is any greater than some low level of gear switching in a single year. Some vessels and permits not used for gear switching are included in the descriptions (e.g. where a leased permit that was used for gear switching was later registered to a vessel that was never used for gear switching and vice versa). Evaluations specific to qualification requirements can be provided as those qualification requirements are narrowed.

The following list covers 14 instances of permit and vessel ownership where the current owner of the permit or vessel would likely be neutral with respect to whether the allocation is based on vessel or permit history.

- Vessels and permits that are under common ownership and have not changed ownership since first accumulation of gear switching history: 9 instances
- Vessels and permits that were traded together or ended up under common ownership: 3 instances
- Vessel and permit have only post-control date history two instances (i.e., non-qualifiers): 2 instances

The following situations cover 25 instances of permit and vessel ownership where the outcome for vessel owners and permit owners would be different depending on whether allocations are based on the vessel or permit (some instances involving a vessel or permit are accounted for multiple times in the list below because of vessels that were used with multiple permits or permits that were used with multiple vessels).

- Vessel left the LE fishery, permit went to a different vessel that accumulated more history (3 instances) or a vessel that left and accumulated no additional history (1 instance); and vessel left the fishery but permit stayed with the same permit owner and was put in “Unidentified” status (1 instance) or went to new permit owner (1 instance)
- Vessel accumulated history with multiple leased permits, vessel sold, owners of leased permits maintained their ownership of the permits and leased them to other vessels (3 instances)

- Vessel leased permit early then stopped gear switching, permit owner maintained permit in "unidentified" status with respect to the vessel registration (1 instance)
- Vessel sold but permit with gear switching history kept, vessel remained active but did not gear switch (1 instance).
- Vessel and permits were under the same ownership through the period but different permits were used, permits were kept by the owner (1 instance).
- Permit used to gear switching with different vessels (4 instances)
- Vessel used to gear switch with different leased permits (3 instances)
- Vessel leased a permit for gear switching then acquired and used its own permit just prior to the control date (1 instance)
- Vessel used a single leased permit for gear switching (2 instances)

Leases were identified as situations where the owner of the vessel did not appear to be the same as the owner of the permit (for internal reference, source file:Permits_Public_Results_III.xlsx Vessel Ownership)**.**

Permits

Section Summary: While the data above presents an overarching view of gear switching from 2011-2018, the following section focuses on the participation by trawl endorsed permits in gear switching through the control date (September 15, 2017). For permits and vessels (discussed further below), the SaMTAAC wanted to look at the amount of gear switching by permit and the number of years that the permit qualified at a given amount. For amounts, the SaMTAAC requested: 15,000, 20,000, 25,000, 30,000, 50,000,70,000, and 100,000 lbs. For number of years, this analysis looks at 1,3, 4, and 5 years. This analysis applies to Alternatives 2, 3, and 4. Between 2011 and the control date,

- *36 permits have landed sablefish north with fixed gear and*
- *a majority of the scenarios could "freeze" the current footprint of gear switching assuming permits did not expand their gear switching activities above their historic maximums (~33% in the last three years)*

Table 27 below provides an update of the analysis from the May meeting and shows the number of permits that would qualify based on a minimum landing amount and participation criteria (i.e. number of years). Note that the following tables for various endorsement levels show the landings, not total QP utilization, for a given criteria level.[8] There have been 36 unique LE trawl permits used to harvest sablefish north with fixed gear between 2011 and the control date. Assuming that only these permits were allowed to continue gear switching and they took their average or maximum amount of landings in a given year, the percent attainment of the 2020 sablefish north allocation (without carryover) would be 52.03-70.03 percent. On the one hand,

[8] Total QP utilization would include discards, which typically represent less than 2 percent of the total available QPs without the application of DMRs.

this projection does assume that all permits that have fished actively fish in 2020; however, as shown in Table 5, only 16 were active in 2018 and therefore the amount of permits operating in any given year is likely less. On the other hand, new entrants are possible which may make use of permits that were retired or unused in 2018, or a permit could be used on multiple vessels, all of which could take a vessel limit (unless use of a single permit on multiple vessels is restricted). As the minimum amount of sablefish landings is increased, the number of permits qualifying decreases. At 70,000 lbs, across all the numbers of participating years, the number of permits that would qualify is the same at six permits. If the SaMTAAC were interested in a level of gear switching that would "freeze" the current footprint (average of ~33 percent in the last three years), then almost all the scenarios except for the one-year participation level (all amounts) and the 15,000, 20,000, and 25,000 at 3 years would allow for permits that qualified for gear switching to take their maximum historic share of the trawl sablefish landings.

Table 27. UPDATED. Number of permits that would qualify based on minimum landings and participation criteria through the control date; total quota pounds that would be caught with fixed gear if each permit lands its historical maximum and average and resulting projected attainment of 2020 trawl allocation; total projected attainment of 2020 trawl allocation if qualified permits each took an annual vessel limit (4.5 percent).

Minimum Amount of Sablefish landed with fixed gear	Number of Years	Number of Permits	Total QPs that would be GS if each permit lands its max in any year	Total % of 2020 Trawl Allocation if permit lands its max in any year	Total QPs that would be GS if each permit lands its avg in any year	Total % of 2020 Trawl Allocation if permit lands its avg in any year	Total % of 2020 Trawl allocation if each permit lands a vessel limit
1	1	36	4,070,804	70.03	3,024,770	52.03	162
	1	33	4,065,896	69.94	3,019,862	51.95	148.5
	3	15	2,134,470	36.72	1,363,189	23.45	67.5
	4	11	1,709,346	29.4	1,101,457	18.95	49.5
15,000	5	9	1,496,135	25.74	1,006,671	17.32	40.5
	1	31	4,029,868	69.32	2,983,834	51.33	139.5
	3	13	2,070,538	35.62	1,323,889	22.77	58.5
	4	10	1,675,303	28.82	1,075,269	18.5	45
20,000	5	9	1,496,135	25.74	1,006,671	17.32	40.5
	1	30	4,007,075	68.93	2,969,968	51.09	135
	3	13	2,070,538	35.62	1,323,889	22.77	58.5
	4	10	1,675,303	28.82	1,075,269	18.5	45
25,000	5	8	1,390,381	23.92	945,502	16.26	36
	1	30	4,007,075	68.93	2,969,968	51.09	135
	3	11	1,853,741	31.89	1,190,083	20.47	49.5
	4	10	1,675,303	28.82	1,075,269	18.5	45
30,000	5	7	1,321,686	22.74	904,609	15.56	31.5
	1	26	3,853,345	66.29	2,851,979	49.06	117
	3	10	1,674,573	28.81	1,121,485	19.29	45
	4	8	1,390,381	23.92	945,502	16.26	36
50,000	5	6	1,206,652	20.76	832,455	14.32	27
	1	22	3,595,688	61.85	2,676,615	46.04	99
	3	6	1,206,652	20.76	832,455	14.32	27
	4	6	1,206,652	20.76	832,455	14.32	27
70,000	5	6	1,206,652	20.76	832,455	14.32	27
	1	21	3,518,787	60.53	2,599,714	44.72	94.5
	3	5	985,981	16.96	729,163	12.54	22.5
	4	4	820,836	14.12	610,681	10.51	18
100,000	5	3	657,059	11.3	480,046	8.26	13.5

Vessels

Section Summary: This analysis presents the same analysis based on the same data as above in the permits section, except is based on the history of the vessel. Again, results may apply to the consideration of Alternatives 2, 3, and 4. Between 2011 and the control date,

- *36 vessels have landed sablefish north with fixed gear; and*
- *a majority of the scenarios could "freeze" the current footprint of gear switching assuming vessels did not expand their gear switching activities above their historic maximums (~33% in the last three years)*

Table 28 below provides the same metrics as Table 27 above, except it is at the vessel level, not the permit level. There have been 36 unique vessels that have landed fixed gear sablefish through the control date. Assuming each vessel took its average or maximum historical landing, the projected attainment of the 2020 allocation would be between 46.8-60.6 percent. This is less than if the permits were the qualifying entity. Additionally, for all of the qualification amounts at 3,4, or 5 years participation levels, gear switching would be less than 35 percent of the 2020 IFQ allocation if every vessel took its historical maximum. If the SaMTAAC is interested in finding criteria that "freezes" the current gear switching footprint (~33 percent), the levels below may provide a sufficient range for consideration.

Table 28. UPDATED Number of vessels that would qualify based on minimum landings and participation criteria through the control date; total quota pounds that would be caught with fixed gear if each vessel lands its historical maximum and average and resulting projected attainment of 2020 trawl allocation; total projected attainment of 2020 trawl allocation if qualified vessel each took an annual vessel limit (4.5 percent).

Minimum Amount of Sablefish landed with fixed gear	Number of Years	Number of Vessels	Total QPs that would be GS if each vessel lands its max in any year	Total % of 2020 Trawl Allocation if vessel lands its max in any year	Total QPs that would be GS if each vessel lands its avg in any year	Total % of 2020 Trawl Allocation if vessel lands its avg in any year	Total % of 2020 Trawl allocation if each vessel lands a vessel limit
1	1	36	3,523,728	60.62	2,718,230	46.76	162.00
15,000	1	29	3,480,828	59.88	2,675,330	46.02	130.50
	3	15	2,024,832	34.83	1,336,916	23.00	67.50
	4	12	1,757,653	30.24	1,164,577	20.03	54.00
	5	9	1,503,303	25.86	1,041,034	17.91	40.50
20,000	1	28	3,464,512	59.60	2,659,014	45.74	126.00
	3	13	1,960,900	33.73	1,294,293	22.26	58.50
	4	10	1,682,471	28.94	1,109,632	19.09	45.00
	5	9	1,503,303	25.86	1,041,034	17.91	40.50
25,000	1	27	3,441,719	59.21	2,645,148	45.50	121.50
	3	13	1,960,900	33.73	1,294,293	22.26	58.50
	4	10	1,682,471	28.94	1,109,632	19.09	45.00
	5	8	1,397,549	24.04	982,013	16.89	36.00
30,000	1	27	3,441,719	59.21	2,645,148	45.50	121.50
	3	11	1,860,909	32.01	1,224,447	21.06	49.50
	4	10	1,682,471	28.94	1,109,632	19.09	45.00
	5	7	1,328,854	22.86	941,120	16.19	31.50
50,000	1	23	3,287,988	56.56	2,523,836	43.42	103.50
	3	10	1,681,741	28.93	1,155,849	19.88	45.00
	4	8	1,397,549	24.04	982,013	16.89	36.00
	5	6	1,213,820	20.88	868,966	14.95	27.00
70,000	1	19	3,030,332	52.13	2,328,027	40.05	85.50
	3	6	1,213,820	20.88	868,966	14.95	27.00
	4	6	1,213,820	20.88	868,966	14.95	27.00
	5	6	1,213,820	20.88	868,966	14.95	27.00
100,000	1	18	2,953,431	50.81	2,251,126	38.72	81.00
	3	6	1,213,820	20.88	868,966	14.95	27.00
	4	5	993,149	17.08	760,569	13.08	22.50
	5	3	664,227	11.43	505,930	8.70	13.50

While there may appear to be a one to one relationship in terms of the number of permits and vessels qualified at a given level, it is important to consider the discussion above regarding

permit-vessel interactions. This can be seen by the difference in pounds that would be hypothetically landed under the qualifying permits' maximum versus the vessels' maximums or averages.

At the 70,000 lb minimum landing criteria, there are six permits and six vessels that would qualify in each of the 3,4, or 5-year categories. Using the vessel as the qualifying unit, if each vessel took its maximum amount of fixed gear sablefish, the amount would be 1,213,820 lbs, but using the permit would be 1,206,652 lbs. That difference of 7,168 lbs is due to the movement of permits throughout the time period across the participating vessels. Of the six vessels that would qualify, the six qualifying permits have been on those vessels at some point in the 2011-control date period. Of the six vessel/permit combinations, three were in lease situations (vessel owner was different from permit owner). By the start of 2019, none of the vessels and only one of the permits had changed ownership (one of the permits which was leased). In addition to the qualifying permits, there were five additional permits that were used with these vessels (thus a total of 11 permits were used by the six vessels). Four of the additional permits might have qualified under a single year qualifier and one under a two-year qualifier. Two of the vessels required at least some of the history from one of the non-qualifying permits in order to meet the qualifier of at least five years greater than 70,000 pounds. Of the six permits that qualified, two of the leased permits required history from more than one vessel in order to meet the 5-year qualifier. One of the qualifying permits was on two of the qualifying vessels during the qualification period.

QS Accounts

Section Summary: In addition to permits and vessels, the SaMTAAC is considering how to recognize investment, participation, and dependence of QS account owners on gear switching activity. The nature of the IFQ program presents new circumstances for considering dependence and participation because quota ownership and fishing history may involve separate entities. The Washington Department of Fish and Wildlife (WDFW) proposed a method for quantifying connections between QS owners and gear switching through the tracking of QP transfers. The method is described below with preliminary, illustrative results provided. This section could apply to consideration of Alternative 1 in determining the opt-out qualification, Alternative 2 for determining the amount of QS in an account associated with gear switching, and may be applied to Alternative 3 (although that alternative does not currently have a QS account qualifying alternative).

Proportional Method -- Connection by QP Transfer

Fishing history—i.e. the landings records associated with a vessel, permit, person, etc.—has been a traditional measure for gauging participation and dependence on a fishery when deciding how to allocate fishing privileges. In the IFQ fishery, two factors have complicated its use.

First, the IFQ program divides the fishing privilege between quota and the LE trawl permit. Quota can be owned without holding a permit and fishing operations may own a permit and fish quota leased from others. In the extreme, quota owners may not fish any of their QP and lease it to independently owned fishing operations. In such cases, the QS account (QSA) owners have no direct fishing history and those who earned the fishing history own no quota (see Figure 7 on page 25).

Second, QP is issued without serial number or other means for tracking distinct units. QP can transfer between multiple vessel accounts (VA) before being used or the year ends and vessel accounts can commingle QP obtained from multiple owners. Where commingling occurs, it may not be possible to trace the exact batches of QP debited for particular catch events or left remaining in a vessel account back to the QSA from which they originated.

To address these issues, WDFW proposed a method that scores each QSA's connection to fixed gear and trawl sablefish fishing by tracing QP transfers and VA fishing history. The method is inspired by social network analysis and the weighted-average cost accounting method for commingled and undifferentiated goods. The outputs it produces can be used to quantify the annual percentage of each QSA's QP associated with the two major fishing strategies (IFQ trawl and IFQ fixed gear/gear-switching). The method works to identify strong ties created by QP trades irrespective of common ownership. It can, however, be adapted to include ownership information from other sources.

The subsections that follow outline the basics of the method and provide summary results. Two potential uses of the method include: (1) the analytical use of the method for understanding the connection between QSA owners and gear switching; and, (2) use as qualifying or eligibility criteria for those alternatives that would place gear-switching limitations on quota.

Scoring QSAs

The proposed method provides a "measure"[9] or score for the amount of QP transferred to VAs in the trading network for a particular QSA, crediting the QSA for a certain portion of the QP in each VA within that trading network. As discussed in the following section, through this scoring system the amount of gear switching associated with each of the VSAs can then be related back to a QSA. The method gives QSAs a score that is derived from the weighted average of all VAs to which they transferred QP and the amount of gear switching associated with those VAs. The weights for the weighted average derive from the amount of QP transferred from a QSA to each VA. More specifically, the QP transferred to each VA can be expressed as a proportion of the total QP transferred out of the QSA. QP transfers between QSAs and VA are recorded in the NMFS IFQ database. For each transaction, NMFS records the amount of QP transferred between the "from" QSA and the "to" VA. The only modification of this source data involves aggregating transactions by year (i.e. summing all sablefish north QP by QSA and summing QP transferred

[9] The nature of the measure is a topic for potential attention in the future. Without precision tracking of particular QP units, the actual accounts where QP ended up cannot be known in many cases. The credit or score the method produces is based instead on trading connections. This includes trades between the QSA and the VA to which its QP are initially transferred plus any other VA with which the initial recipient transfers its QP, and down through a trading chain. In this manner, the score indicates how revenue was likely earned for a QSA's QP in terms of trawl versus gear switching caught sablefish.

between unique “from” and “to” account combinations by year).The weighted average is then calculated by multiplying each VA’s QP activity portfolio by the relevant proportion and then summing the results from all VAs.

Figure 19 illustrates the concept. Looking to that example, the QSA transfers to three VAs. The QSA receives a total QP allocation of 12,000 lbs. and transfers 5,000 lbs. to VA1; 3,000 lbs. to VA2; and 4,000 lbs. to VA3 (upper left graph). The next step is to divide each QSA-to-VA transfer by the QSA’s total QP (upper right graph). Those fractions can be reduced and converted to decimal proportions (lower graph). The results show that QSA would be scored using 41.7 percent from VA1’s QP activity portfolio, 33.3 percent from VA2’s, and the remaining 25 percent from VA3’s. The VA’s QP activity portfolio provides information on the amount of gear-switching in which the vessel engaged. The means of quantifying the VA QP activity portfolios are described in the next subsections.

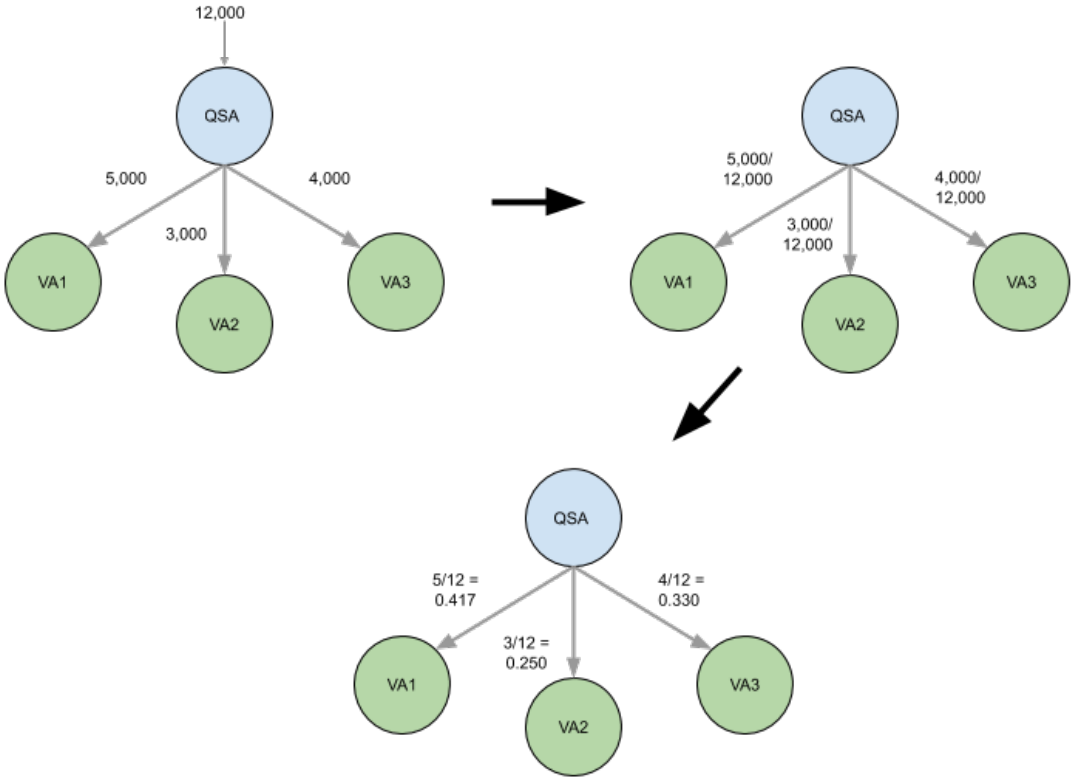

Figure 19: Illustration of how the QSA-to-VA weighted averages are calculated. See the text for explanation.

The VA QP Activity Portfolio

The QP activities of each VA can be described as an annual portfolio which consists of “direct” and “indirect” components. Figure 20 depicts the component categories of the QP activity

portfolio and the data sources used to calculate them. The indirect part of the portfolio is described in the next subsection.

The direct portfolio consists of the QP directly debited from the VA for fishing or QP remaining in the VA at the end of the year. These include the "Fished in Year", "Used for a Prior Year Deficit", "Remaining", and "Other" categories. The "Transferred" category, while also part of the direct portfolio, is of a different nature and is discussed in more detail below. The method calculates the proportion of a VA's QP falling into each category and these proportions provide the basis for the method's scores.

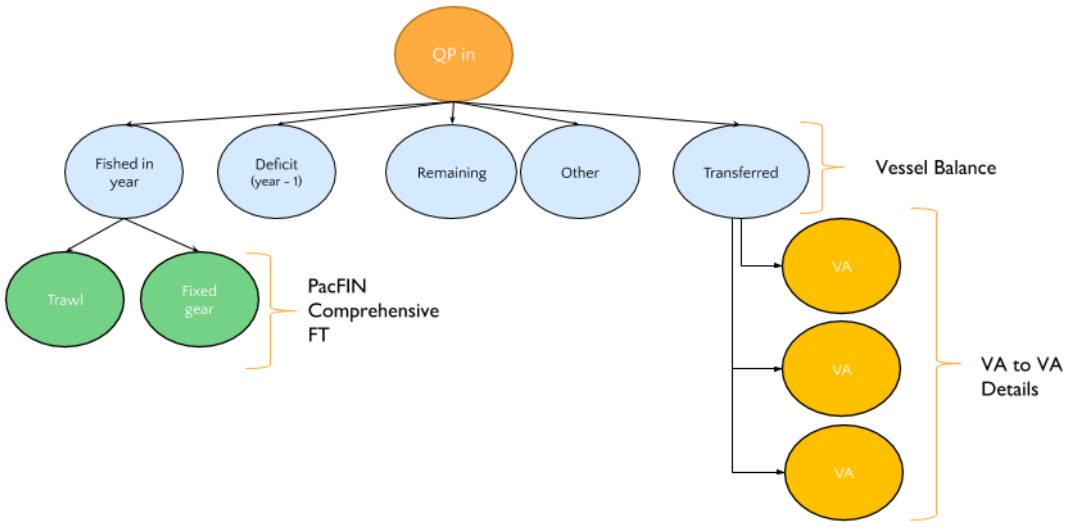

Figure 20: Illustration of the VA QP Activity Portfolio with data sources identified. Usage by trawl or fixed gear is a subset of the "Fished in Year" category. QP transferred from the VA to other VAs produces an "indirect" portion of the portfolio, as described in the text.

For application to the alternatives under consideration by the SaMTAAC, the "Fished in Year" category is further subdivided by gear type into two-categories—trawl and non-trawl. The gear switching category equates to fishing by any non-trawl gear type. For every VA with record of fishing sablefish north QP, the proportion fished by gear type is determined. The proportion of QP fished by fixed gear would be of primary interest for use as qualification or eligibility criteria.

The primary source data and portfolio categories come from the NMFS IFQ Vessel Balance table, which records the QP history for each VA for the year. However, the NMFS IFQ database does not currently incorporate the gear information recorded on fish tickets. The PacFIN

Comprehensive FT table does and can be linked to NMFS Vessel Balance table using the VA identification numbers. Discards are assumed to have the same gear breakdown as landings.[10]

Indirect VA QP Activity

The Transferred QP portfolio category represents a transitory state for QP. The other four categories, in contrast, describe final states. At the end of the year, QP transferred will have fallen into one of those four categories within some VA. The weighted average method traces that indirect portion to the likely end-of-year VA and portfolio category. The calculation is performed in the same manners as with the QSA scoring, i.e. the proportions of QP transferred to each VA serve as the weights for the weighted average. If a VA transferred 10 percent of its QP to a VA, then it is credited with 10 percent of each category in that VA's QP activity portfolio. To further illustrate, if the fished with fixed gear category in that portfolio equaled 90 percent, then 9 percent would be added to the transferring VA's indirect fixed gear portfolio (i.e. 0.10 x 0.90 = 0.09).

The calculation of the VA-to-VA weighted averages requires iteration to solve because, unlike QSA-to-VA transfers, VA-to-VA transfers are not necessarily one-way. For example, a VA may transfer to another VA, whose owners then transfer to a third VA. That third VA can transfer QP back to the original VA thereby creating a circular dependency (i.e., the VA's weighted average is a function of itself). With sufficient iterations, the transferred QP can be assigned to an end-of-year portfolio category such that the sum of all end-of-year VA portfolio categories equal one for each VA (i.e., 100 percent).[11]

As with QSA to VA transfers, NMFS records VA to VA transfers in the IFQ database. As with the QSA-to-VA transaction data, the only preparation step needed involves aggregating the source data by unique "from" and "to" account combination and year.

The Network Perspective

The previous subsection described how the VA to VA weighted average calculates the indirect QP activity portfolio. The weighted average equation for a VA only includes the VAs that are directly connected by QP transactions. However, in turn, the equations for those partners include VAs they transacted with, and so on. The effect of this is that indirect activity portfolios can be influenced by VAs that one has never transacted with directly.

The issue of distantly related VAs influencing the method's scoring has arisen in preliminary discussions. The phenomenon can be explored more directly using a calculation that is similar to the iterative weighted average but that more directly calculates the contributions of indirectly related VAs.[12] Using the terminology of graph/network analysis, each VA can be represented as

[10] The gear proportions for discard could be calculated directly using observer and EM data. However, the assumption is economical and thought to be reasonable because the majority of QP is debited for landed catch and it would be highly unlikely for a vessel's gear usage to differ between landings and discards.

[11] The method for iterating through the weighted average calculations is not provided here but can be provided.

[12] The benefit of the approach is that it allows direct evaluation of how each transfer degree contributes to the indirect portfolio for a VA. The iterative method cannot provide this information as the iterations only serve to work

a “node” with transfers between VAs represented using “edges”. The proportion of QPs transferred serves as the edge’s weight. The degree of relationship between two VAs is equal to the number of edges separating them. A VA that transfers to a VA has a “first-degree” relationship with that VA. If that second VA transfers to other VAs, two edges would need to be crossed to reach the original VA. This represents a second-degree relationship. And so on.

The effects of indirect relationships on the scores are examined below. In general, those effects would be expected to attenuate rapidly by transfer degree because any transfer of less than 100 percent of a VA’s QP will reduce the weight in the next degree. For example, envision a third-degree relationship where the three edges all have weights of 10 percent. The third-degree relationship weight would be equal to one percent (i.e. 0.10 x 0.10 x 0.10 = 0.001). In this case, if a VA located three degrees away had a fixed gear usage percentage of 90 percent, the contribution to the indirect portfolio would be 0.09 percent (i.e. 0.001 x 90 percent). While relationships in the sablefish north QP market can be separated by six-degrees or more, the effect of the distant relationships is very small.

Application to QS Holdings

The WDFW weighted average method produces the proportion of QP falling into each portfolio activity category by QSA and year, or what staff has termed the “QSA score”. To understand the potential allocative changes related to the use of the scores as qualification or eligibility criteria, those proportions need to be translated to QS.

To translate the scores to QS, the portfolio scores are simply multiplied to the QSA’s QS holdings. For example, if an QSA had a score of 0.8 for “Fished with Fixed Gear” and that QSA owned one percent of the sablefish north QS, then the result would be 0.8 percent of that QSA’s QS would be linked to fixed gear activity. However, one or more points in time must be chosen for when to apply the scores to the QS holdings. To reduce the number of scenarios produced here, the results shown in the follow sections are based on QS holdings on the September 15, 2017 control date.

While the analysis centers on the control date holdings, it is important to consider that there have been changes in sablefish north QS ownership since the control date. As of September 23, 2019, there are 129 QSAs holding sablefish north QS compared to 128 on the control date. There are now 11 QSAs with sablefish north QS that either did not exist or own the QS on the control date, 23 that own more QS now than they did on the control date, and five that own some QS but less than at that time. Figure 21 compares the cumulative distributions between QS holdings now and at the control date. The middle of the distributions looks largely the same with some notable differences in the ends of the distribution. In particular, QSAs in the upper 15th percentile of the distribution have added to their QS holdings.

QP transfers through circular references. In cases where QP never comes back a VA, the weighted average takes all indirect relationships into account from the start. As with the iterative weighted average, the calculations can be provided.

Another aspect to note is that some QSAs with IFQ history during 2011-2017 no longer appear to own sablefish north QS. In total, there are 22 QSAs with scores produced by the weighted average that held no sablefish north QS on the control date.

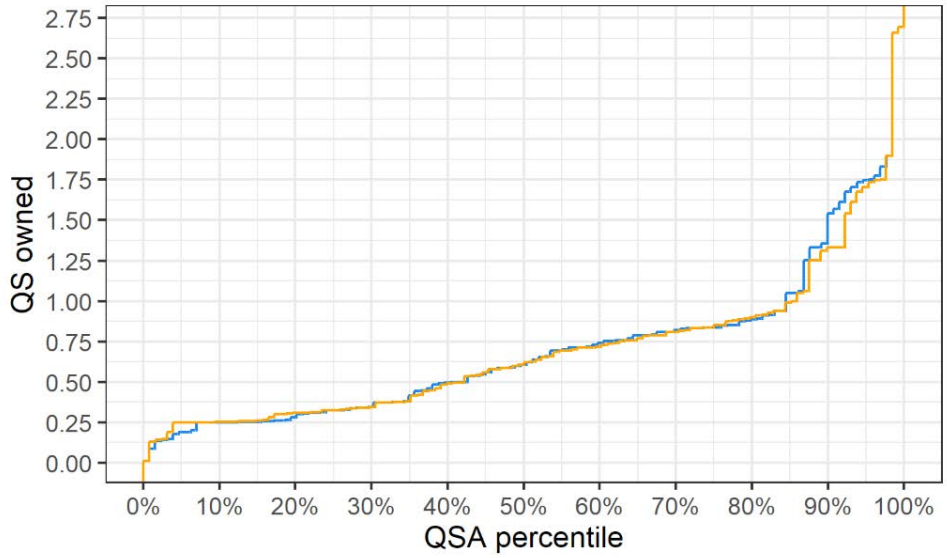

Figure 21: Cumulative distribution of QS held by QSAs on the control date (orange/light) compared to holdings on September 23, 2019 (blue/dark).

Summary Results

Table 29 shows the results of the weighted average portfolio scoring aggregated across all QSAs each year, 2011-2018. The scores represent the proportion of QP falling into the "Fished in Year" portfolio category broken out by the two gear categories. These results are shown to demonstrate the consistency of the method's results with the catch statistics reported in Table 1.

Table 29. Percentage of all QSAs' QP activity portfolios scored falling into the two gear portfolio categories by year, expressed as a percentage of QP traced to the Fishing in Year portfolio category and also as a percentage of all QP transferred out of QSAs each year.

Year	Fished QP		All QSA QP	
	Gear Switch.	Trawl	Gear Switch.	Trawl
2011	28.9%	71.1%	27.2%	66.9%
2012	34.1%	65.9%	29.9%	57.7%
2013	24.5%	75.5%	23.3%	71.8%
2014	31.3%	68.7%	28.8%	63.2%
2015	33.8%	66.2%	32.6%	63.8%
2016	36.4%	63.6%	33.8%	59.1%
2017	33.7%	66.3%	33.0%	64.9%
2018	35.9%	64.1%	32.3%	57.5%

Table 30 summarizes an example application of the gear switching scores based on ideas discussed at the May 2019 SaMTAAC meeting. These results should be viewed as preliminary and intended to illustrate of how the scores could be applied.

The Table 30 scenarios vary two main criteria, the minimum number of years of sablefish north QP history and a minimum gear switching connection score. The results shown are based on one way of compositing the scores. The composite used in these examples consists of the QP falling into the "Fished in Year" and "Prior Year Deficit" categories, plus up 10 percent of QP in the "Remaining" category. The gear switching score derives from the proportion of the "Fished In Year" category fished with fixed gear.[13] The logic is that these are "non-stranded" QP categories and contribute to the revenues of the fishing operation. Other ways of treating the Prior-Year Deficit and Remaining QP categories could be examined. For instead, they could be ignored by using the pure proportion for QP Fished in Year by gear switching.

As noted, the scores shown in Table 30 do not incorporate information on ownership but could be using the "self-trade" transfer, the information on common ownership obtained from public records, or both.

[13] The numerator is the proportion fished with gear switching gears and the denominator is the proportion in the "Fished In Year" category. The other possible denominator to use consists of all end-state QP categories.

Table 30. Eligibility scenarios and preliminary results from the weight average scoring method. To illustrate how to read the table using the first row, there are 34 QSAs that have 5 or more years with a gear switching score of 0.25 or more of their Sablefish North QP associated with gear switching. Those 34 QSAs held 22.2 units of QS on the control date, which equates to 24.7 percent of the Sablefish North QS.

Years	Gear Switch QP Score	QSAs	QS	% of QS Allocated[a/]
>= 5	*>= 0.25*	34	22.200	24.7%
	>= 0.50	22	15.119	16.8%
	>= 0.75	11	9.859	11.0%
	>= 0.90	8	8.021	8.9%
	>= 0.95	7	6.767	7.5%
>= 4	*>= 0.25*	42	26.269	29.2%
	>= 0.50	26	16.117	17.9%
	>= 0.75	21	14.507	16.1%
	>= 0.90	9	8.021	8.9%
	>= 0.95	9	8.021	8.9%
>= 3	*>= 0.25*	57	34.385	38.2%
	>= 0.50	41	26.300	29.2%
	>= 0.75	27	17.378	19.3%
	>= 0.90	22	15.140	16.8%
	>= 0.95	14	10.794	12.0%
>= 2	*>= 0.25*	72	42.097	46.8%
	>= 0.50	54	32.310	35.9%
	>= 0.75	38	22.781	25.3%
	>= 0.90	28	18.417	20.5%
	>= 0.95	19	13.906	15.5%
>= 1	*>= 0.25*	97	61.803	68.7%
	>= 0.50	80	47.212	52.5%
	>= 0.75	64	40.298	44.8%
	>= 0.90	53	31.743	35.3%
	>= 0.95	44	27.181	30.2%

a/ 10 percent of the QS remains unallocated but the associated QPs are distributed to QS holders in proportion to their QS holdings.

Evaluation of Network Effects

As noted above, the effects on the methods scores coming from VAs located multiple degrees of transfers away from the directly linked VAs has been of interest. QP transfers have been a significant feature for sablefish north QP with increasing transfer volume seen across time. In 2018, the total volume of QP transfers reached 89.6 percent of total QP issued to the sector (Figure 9). Fishery participants transfer QP among VAs for various reasons ranging from logistical transfers among commonly owned businesses to arms-length transactions for profit.

Figure 22 explores these effects by focusing on how far gear switching scores taken at each degree of relationship (i.e. taking into VAs separated by one degree of separation, then two degrees, etc.) differ from the score after all degrees are taken into account. The x-axes of the panels identify how far the proportion of gear switching QP is from the final value. Each panel of Figure 22 represents a degree of separation. The zero-degree panel identifies how different scores would be if only the VA activity portfolios connected by first-transfer were used to develop the QSA score. The first-degree panel ("1") shows the effect of taking the first-transfer VA's first-degree partners into account, and so on. Note that the horizontal scale changes between the graphs.

Looking to zero on the x-axis in each panel, the straight-line vertical portion of the lines identify the percentage of QSAs already at their max gear switching score at that transfer degree. For example, in the zero-degree panel, it can be seen that ~37.5 percent of QSA records reached their max by the first transfer. The remaining cases show a broad range, from ~0.01 to ~0.99 points away from their max score. Moving through the panels, it can be seen that the percentage of cases seeing no change grows and the degree of difference on the x-axis becomes smaller and smaller. For instance, in the second-degree panel it can be see that roughly 25 percent of cases are still off from their ending values but most every account is within 0.1 points. The number of cases showing differences in the third-degree is down to about 15 percent and the differences are down to three decimal points with a small percentage of the cases still showing a few percentage points of difference. In the final panel, showing the fifth-degree, the differences are four decimal places out (i.e. hundredths of a percent).

More panels could have been included in Figure 22 yet would only show ever decreasing influence on the final gear switching scores. The method searched for up to 11 degrees of separation and some QSAs to show relationships that distant and would have shown further relationships had the algorithm gone further (Figure 23). Again, the effect of these distant relationships on the weighted average portfolio scoring is exceedingly small. Figure 24 shows the degree at whichthe sum of all end-state QP portfolio categories stabilize to 0.99.[14] This view shows that the majority of cases stabilize after second-degree transfers are taken into account with a good number needing three-degrees and then a quick drop off from there.

The significance of this pattern would depend on how the scores were ultimately used. For example, stabilizing to the nearest percentage point may matter for some QSAs if a threshold like those in the Table 30 scenarios were used. At the same time, the QSA may have stabilized as being either predominately connected to gear switching or trawl gear types well before the portfolio as a whole reaches its asymptote (e.g. a portfolio may only have 75 percent of its QP traced to an end state but already clearly be trawl or fixed gear denominate).

[14] Once all iterations in the weighted average calculation are complete, the sum will equal 1.

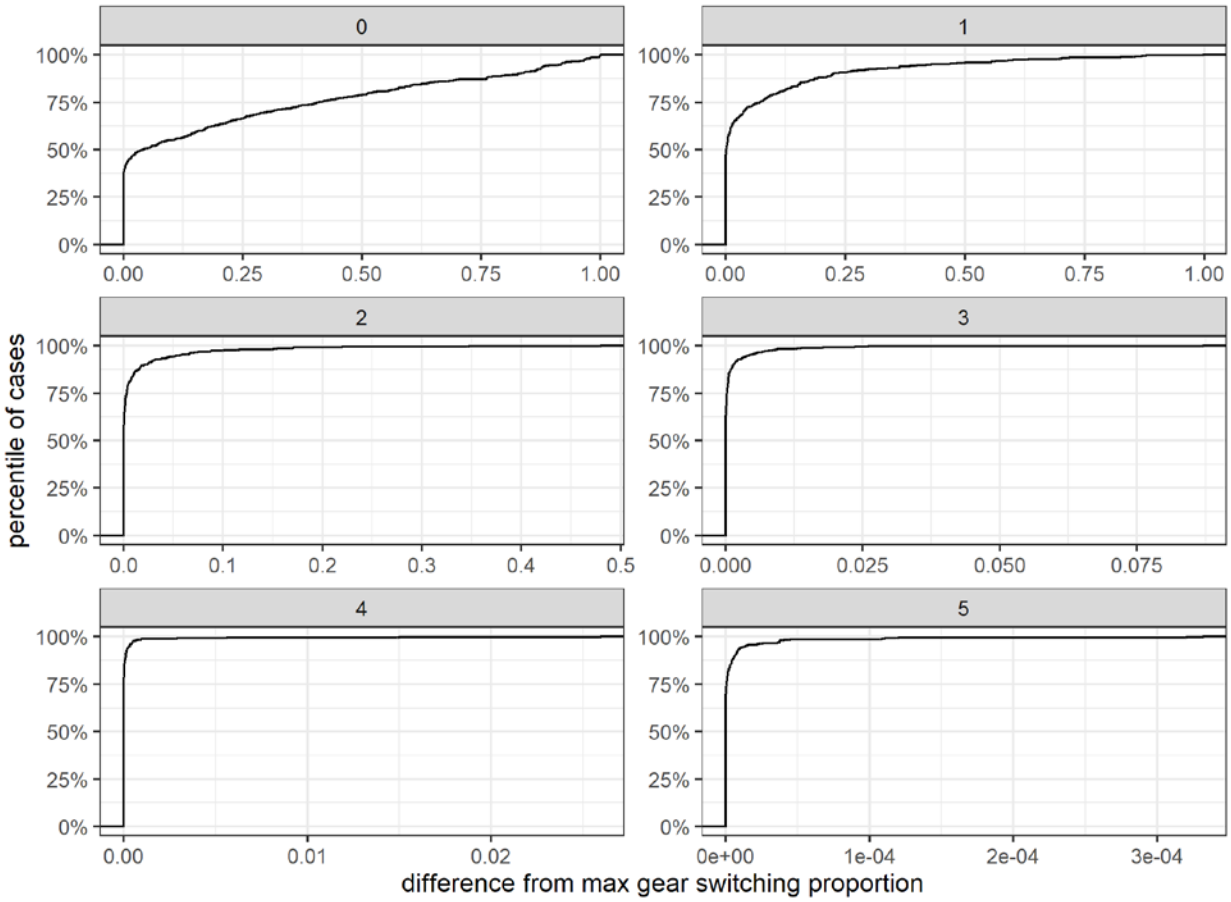

Figure 22. Cumulative distribution plots showing how far QSAs' gear switching scores are from ending value at six different degrees of separation. "Zero" degree refers to the VAs related to the QSA by first-transfer. The difference expressed as the final score minus the score at the transfer degree (i.e. if the final score is 0.90 and the score at degree 1 is 0.85, the difference is 0.05). See the text for additional explanation. Note that the horizontal scale changes between most of the graphs.

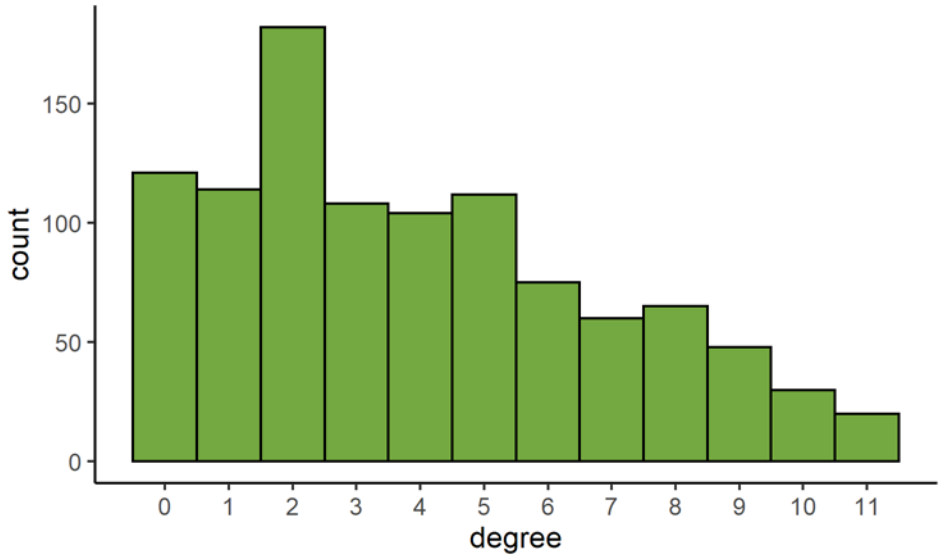

Figure 23. Counts of the maximum degree of transfer relationship detected for QSAs, 2011-2018.

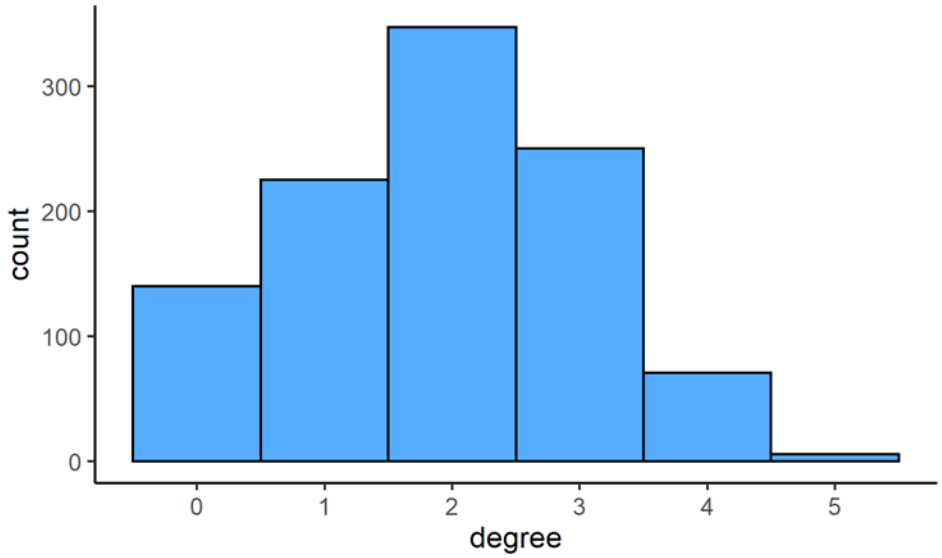

Figure 24. Counts of the degree at which QSA QP activity portfolios stabilize to the nearest percentage point for all QSAs, 2011-2018.

Conclusion

The description of the weighted average QP activity portfolio and illustrative results for sablefish north QP are offered to advance discussions at the SaMTAAC. Further detail and rationale for the approach will be provided as appropriate. In summary, the method is offered as a means of

providing information on connection and dependence to gear switching and trawl fishing activities for all QSAs that have held sablefish north QS. The method can be used in analysis of the MSA fair and equitable and related criteria, discussed above, as well as part of qualification and eligibility criteria for the gear-based quota alternatives that sought to hold those with established gear switching participation and investment differently from those that do not.

Lastly, while the method appears to reflect the patterns expected from gear switching activities observed over 2011-2018 there are limitations to what it can measure. The method does not focus on identifying precisely how a batch of QP originating from a QSA was used. Instead it relies on aggregate patterns and the idea that business viability depends on revenues in full over the year.[15] There are some conceivable scenarios where average patterns might fail to capture the full picture. Segregation of fishing activities would be one example where the method might provide a mixed signal. For example, a business running a single VA may fish both gear strategies in a year and might use QP from its own QSAs to trawl and then leases from other QSAs to supply its fixed gear trips. If gear switching were eliminated, the business may remain viable by continuing to trawl its own QP. However, it may or may not do business with the QSAs it worked with for fixed gear trips. In such a case, the business' own QSA would score as having a relationship to gear switching and the other QSAs would only show up as partially dependent on gear switching. With fewer than two vessels on average fishing with both gear strategies in a year, such circumstances may be unlikely or uncommon. Moreover, the gear switching suppliers would still score as partially exposed to gear switching limitations, just not fully so.

Other Considerations Related to Allocation to QS Accounts

A note on LE permits and VA with implications for QS accounts: In most cases, there is a one-to-one correspondence between an LE permit and a vessel with a QP account. A vessel needs both the LE permit and the VA in order to participate in the fishery and the establishment of a VA requires a vessel and an LE permit. However, after the account is established, the LE permit can be transferred from the vessel and the vessel owner can maintain the QP account associated with that vessel and renew it each year even though there is no trawl LE permit associated with the vessel. While such a vessel is unable to participate in the fishery because of the lack of an LE permit, they do, for example, provide entities such as risk pools a place that QP can be stored until it is needed by a specific vessel within the pool. If the vessel owner sells the vessel, the vessel account will remain active but not be renewable for the following year (unless an LE permit is once again registered to the vessel). While there have not been proposals to allocate to VA, there is a proposal to allocate to QS accounts based on the gear switching history of vessels that may be traced through vessels or vessel accounts. The existence and implications of QP accounts not associated with active LE vessels may need to be taken into account in specifying provisions that would allocate to QS accounts.

[15] The market-based rationale for the approach is a topic that can be elaborated on in the future.

Alternative Specific Provisions

Section summary: While the above analyses are intended to provide general background and information to help support the SaMTAAC in the selection of their final range of alternatives and general elements of each alternative (e.g., criteria for opt-out or endorsement), there are a few specific elements of the alternatives that are discussed in detail below.

Alternative 1: Limiting Gear Switching by Placing Gear Designations on Quota

Section summary: Alternative 1 would issue some northern QPs as "trawl only" and others would remain unrestricted (i.e. status quo). Every QS owner would receive the same proportion of their QP as trawl only and unrestricted, unless the "opt out" option is chosen. At a designated time, the trawl only QPs would revert back to unrestricted QPs. There are two main questions for consideration to complete this proposal:

1. *What percentage is to be issued as "trawl only"?*
2. *What is the conversion date?*

This section provides some information intended to aid in the consideration of the conversion date. Information provided there may also be useful in deciding the percentage to be issued as trawl only.

Conversion Date for Trawl-Only QP

Section Summary: If the Council selects Alternative 1, there is the consideration of what the conversion date would be for those "trawl only" QPs to change into status quo sablefish QPs (i.e. could be used for trawl or fixed gear). This section provides historical patterns of gear switching use of QPs by the proposed conversion dates.

In considering a conversion date for sablefish QPs to switch from "trawl only" to "any gear," there have been concerns that the conversion date could be too late for gear switching vessels to obtain their quota before the end of the year. Below, there are tables that show the percent of the total sablefish north QPs caught with fixed gear compared to the total QPs used by fixed gear in that year (Table 31) and the total available QPs (Table 32) in that year through July, August, and September. As a reminder, the current alternative has conversation date options of August 1, September 1, and October 1; therefore, the amount of QPs utilized through July 31 would show the amount that would be taken from August 1 forward in a given year. Note that these are total QPs, not just landings, and discards are apportioned by gear type through the proportional method described under the QS Account section above.

Historically, gear switching vessels have landed on average less than 25 percent of their total fixed gear landings through the end of July, less than 35 percent through August, and around 60 percent through the end of September. While there has been variation in the amounts taken by month, with over a high of over 70 percent being caught by the end of September in 2015, there is a high likelihood that at least 30-40 percent of the sablefish utilized by fixed gear would be caught after October 1, with 50-70 of the landings typically occurring before October 1.

Table 31. Percent of IFQ sablefish N QP used by fixed gear as of August 1, September 1, and October 1 from 2011-2018.

Use through	Conversion Date Option	2011	2012	2013	2014	2015	2016	2017	2018	Average
July	August 1	9.49	22.62	22.81	25.86	32.45	27.48	25.71	33.93	25.04
August	September 1	17.63	29.53	34.59	36.76	42.74	38.36	35.4	43.91	34.87
September	October 1	46.45	55.91	63.76	69.1	72.96	56.94	57.82	53.13	59.51

Looking at the utilization by fixed gear compared to the total available QPs for sablefish north, 2018 saw the greatest percentage of use by August 1, with 10.91 percent. On average, vessels took 7.67 percent across the eight years through the end of July. By the end of September, fixed gear utilization has ranged from 12.62 percent (in 2011) to 23.38 percent (in 2015).

Table 32. Percent of total sablefish N QPs used by fixed gear as of August 1, September 1, and October 1 of 2011-2018.

Use through	Conversion Date Option	2011	2012	2013	2014	2015	2016	2017	2018	Average
July	August 1	2.58	6.94	5.26	7.38	10.4	9.23	8.64	10.91	7.67
August	September 1	4.79	9.06	7.97	10.49	13.7	12.88	11.89	14.12	10.61
September	October 1	12.62	17.16	14.7	19.72	23.38	19.13	19.43	17.08	17.90

Given these trends, if the SaMTAAC were to consider moving forward with this alternative and wanted to ensure that there was sufficient quota prior to the control date to allow for historical levels of gear switching, they could consider the following options:

For August 1, there would likely need to be between 7-11 percent of total available QPs available to be “all gear”.
For September 1, there would likely need to be between 10-15 percent of total available QPs available to be “all gear”.
For October 1, there would likely need to be between 17-24 percent of the total available QPs as “all gear”.

Note that these ranges are more reflective of more recent years as opposed to the earlier years in the program. Additionally, while these percentages would likely cover historic gear switching levels by the sector, if the option allowing an "opt-out" opportunity for every vessel is not selected, there may be some vessels who would need to acquire additional "any gear" QPs on the market prior to the control date if they do not have enough quota from their own QS account or commonly used relationships.

Alternative 3: Gear Switching Endorsement and Allowance

Gear Switching Limits for Vessels With Endorsements

Under Alternative 3, there are currently three endorsement limit options:

1. Maximum percent of sablefish north trawl allocation landed with fixed gear by vessel or permit between 2011 and the control date. Percentage stays with permit.
2. Less than amount under option 1, may be implemented immediately or phased in over 10 years
3. Status quo annual vessel limit of 4.5 percent.

Table 27 and Table 28 above describe the potential impacts of various qualifying levels for vessels or permits that meet the specified criteria. For Option 1, the maximum percentage of a year's allocation that was gear switched by a vessel or a permit ranges from 0.00006-4.43 percent. If every vessel took their maximum between 2011 and the control date, it would result in 68.69 percent gear-switching; for permits, it would total 78.87 percent. However, these percentages are also reflective of when sablefish allocations were lower and therefore it took fewer pounds to achieve a higher percentage. As shown in Table 27 and Table 28, if every vessel/permit gear switched at their maximum annual fixed gear sablefish north level, the resulting gear-switching would be would be 60.62 and 70.03 percent of the 2020 allocation for permits and vessels, respectively. While Option 3 would allow every vessel to take a full annual vessel limit, there are few vessels that take historically taken close to the annual vessel limit of 4.5 percent. As shown in Figure 25 below, there have been only 12 vessel/year combinations before the control date where the landings of fixed gear sablefish north exceeded 4 percent of the allocation. Note that this figure does not include discards.

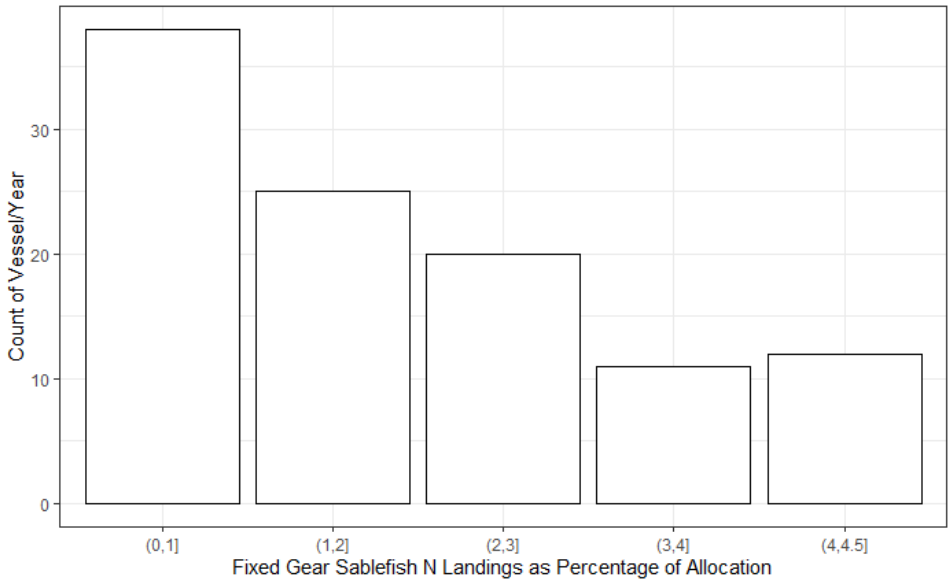

Figure 25: Count of distinct vessel/year combinations by percentage of allocation of sablefish north harvested with fixed gear in a given year

Gear Switching Limits for Vessels Without Endorsements

Section Summary: Under Alternative 3, there would be some continued fixed gear harvest of sablefish for those vessels that do not have an endorsement. In order to provide an indicator of what an appropriate and economically viable level may be, staff examined vessels that used trawl and fixed gear to harvest sablefish in a given year as well as vessels that targeted species other than sablefish with fixed gear.

- *Only 10 vessels have harvested sablefish north with trawl and fixed gear in the same year from 2011-2018.*
- *There have been only 62 trips by 17 vessels coastwide that have fixed gear landings where sablefish comprised less than 50 percent of the trip's total landings.*

Alternative 3 includes a limit for gear switching of sablefish north of 36° N. lat. for those vessels without an endorsement. In order to provide an indicator for what might be a low but viable limit for these vessels, information is provided on two historical populations: (1) Vessels that used trawl and fixed gear within a year; and (2) those vessels that targeted non-sablefish species with fixed gear using an LE trawl endorsed permit. The analysis of these two groups is followed by an assessment of the projected gear switching for those vessels that may not receive an endorsement.

Vessels that Used Trawl and Fixed Gear

From 2011-2018, there have been 10 vessels that have landed sablefish with both fixed gear and trawl gear in a given year. Fewer than three vessels have used both gears to land sablefish in

more than one year. While the sample size is limited, the historical catch with fixed gear by these vessels may provide the SaMTAAC with a sense of the amount of gear switching that would need to be allowed for it to be an economically viable opportunity for those trawl vessels that may not receive an endorsement. This assessment is based on the assumption that at least some of this historical activity has proved economically viable for the participants.

Table 33 below depicts the average pounds of sablefish north landed with fixed gear and the average percent of the total sablefish landings made with fixed gear by a vessel/year combination. Due to confidentiality, the vessel/year combinations were ranked based on the amount of sablefish landed with fixed gear and then grouped into three categories: Category A (representing the lower 33 percentile of landings); Category B (representing the middle 33 percentile of landings), and Category C (representing the top 33 percentile of landings). The vessels in Category A are those vessel/year combinations that had the lowest amount of sablefish caught amongst the records. Even at this lower level of fixed gear participation, these vessels averaged 13,112 lbs in a year and fixed gear sablefish accounted for an average of 53.6 percent of those vessels' total IFQ sablefish landings. Overall though, these vessels were more dependent on trawl landings, as only 15.5 percent of their total groundfish landings (a majority being IFQ fixed gear sablefish) were landed with fixed gear. The top two tiers (Categories B and C) saw over 80 percent of their IFQ sablefish landings being made with fixed gear on average, but the Category C vessels were more active in fixed gear fisheries overall with 29.8 percent of their total groundfish being landed with fixed gear compared to 19.5 percent for Category B.

Table 33. Vessels which fished sablefish N with trawl and fixed gear in a given year: average lbs of sablefish north landed with fixed gear, average percent of total IFQ sablefish landings made with fixed gear, average percentage of total groundfish landings from IFQ fixed gear sablefish, average lbs of groundfish landed with fixed gear, and average percentage of total groundfish landed with fixed gear.

	IFQ Sablefish				Groundfish	
Category	Average Lbs Landed with FG	Avg. Lbs. as Percent of 2020 Allocation	Average percent of total IFQ sablefish landings made with FG	Average percentage of total groundfish landings from IFQ FG Sablefish	Average lbs landed with FG	Average Percentage of Landings made with FG
A	13,112	0.23%	53.6	13.6	28,177	15.5
B	40,766	0.70%	88.7	18.3	42,894	19.5
C	125,586	2.16%	83.8	29.6	126,243	29.8

Using those same groupings, the following table looks at the revenue from those sablefish landings and how they contribute to the economic portfolios of those vessels (Table 34). Overall, IFQ fixed gear sablefish tended to account for approximately 3-7 more percent in revenue compared to the proportion of pounds made with fixed gear in the IFQ sector. However, when examining these vessels' full portfolios, IFQ fixed gear sablefish accounted for 37.1

percent (Category A) to 59.2 percent (Category C) of the vessels' total groundfish revenue. Therefore, while fixed gear sablefish was smaller proportion of overall groundfish landings, it accounted for a significant amount of revenue for these vessels. Overall, the majority of the revenue from fixed gear was from IFQ sablefish.

Table 34. Vessels which fished sablefish N with trawl and fixed gear in a given year: average ex-vessel revenue from sablefish north landed with fixed gear, average percent of total IFQ sablefish revenue from fixed gear, average percentage of total groundfish revenue from IFQ fixed gear sablefish, average ex-vessel revenue from groundfish landed with fixed gear, and average percentage of total groundfish revenue.

	IFQ Sablefish			Groundfish	
Category	Average Revenue from IFQ FG Sablefish	Average percent of total IFQ sablefish revenue made with FG	Average percentage of total groundfish revenue from IFQ FG Sablefish	Average ex-vessel revenue from FG	Average Percentage of Revenue made with FG
A	$33,938	60.7	37.1	$39,919	37.8
B	$123,704	92.1	54.4	$129,020	57.3
C	$309,725	86.5	59.2	$310,101	59.3

Non-Sablefish Gear Switching Vessels

In May, the SaMTAAC was interested in understanding the level of gear switching for species other than sablefish in order to determine if any gear switching limits would be overall or for sablefish specifically. After discussions and review of that data, the SaMTAAC agreed that gear switching limits would only be considered for sablefish north of 36° N. lat. However, Alternative 3 includes some low level sablefish gear switching limits for those vessels without an endorsement. The data below may provide some guidance on the limits that might be set for vessels without gear-switching endorsements. Table 35 below provides an update of a table provided at the May SaMTAAC meeting and additionally provides the average landings of sablefish per trip in the indicated groups. Groups were based on the percentage of sablefish that made up the total landings on a trip. Coastwide over 8 years, there were 17 vessels that took 69 fixed gear trips that were less than 50 percent sablefish. For those trips where sablefish made up 26-50 percent of the total landings, the average landings of sablefish are just less than 2,200 pound round weight.

Table 35. **UPDATED** Gear switching vessel trips that do not target sablefish, Coastwide number of trips, vessels, and average landings of sablefish (rd. wt. lbs) per trip on IFQ fixed gear trips with less than 50% sablefish.

Group	Number of Trips	Average Landings of Sablefish Per Trip (lbs)	Average Revenue from Sablefish per Trip	Average Percentage of Total Revenue Per Trip from Sablefish
No Sablefish	50	0	0	0
25% or less Sablefish	8	1,066	1,805	16.8
26-50% Sablefish	11	2,194	4,540	97.9

Using the IFQ management areas to separate trips north and south of 36° N. lat., there were only 18 trips north of 36° N. lat. since 2011 by four vessels that landed groundfish with fixed gear where the landings consisted of less than 50 percent sablefish. Of those 18 trips that included sablefish in the delivery, the average total landing weight was 2,050 pounds (round weight).

The data above describes the average landing per trip of sablefish on non-sablefish targeted trips with fixed gear. However, a limit for gear switching of sablefish for those non-endorsed vessels would likely be on a vessel-year basis. The four vessels with history of non-sablefish targeted trips north of 36° N. lat. took an average of 15 IFQ trips a year. Using 100 simulations of random sampling of trip level catch of sablefish (zeros included) from the 69 "non-sablefish" trips coastwide, assuming 15 trips a year, results in the following distribution of potential total catch of sablefish in a given year for the vessels (Table 36).

Table 36. Distribution of projected landings of sablefish north per vessel from 100 simulations of non-sablefish targeted trips and the percentage of the 2020 IFQ allocation.

Quantile	25%	50%	75%	99%
Sablefish (lbs)	2,331	5,694	10,692	23,590
Percentage of 2020 Allocation	0.04%	0.10%	0.18%	0.41%

Under the low level limit, if vessels wanted to continue to pursue a fixed gear strategy within the trawl sector for non-sablefish species, the above distribution shows what a vessel could land for sablefish if targeting other species (e.g. thornyheads, slope rockfish) with fixed gear. If the limit is a landing limit, any sablefish caught in addition to the limit would have to be discarded. However, the catch is occurring under the IFQ program so there is no reason it could not be specified as an annual catch or mortality limit (i.e. a catch limit with survival credits), in line with the way sablefish is managed under the IFQ program.

Interaction Between Endorsement Qualifiers and Potential Gear-Switching by Non-endorsed Vessel

To provide some examples of the potential effects that implementing endorsements may have on vessels that have historically gear switched but would not meet the criteria, the following tables looks at three endorsement levels (15,000 lbs, 30,000 lbs, and 70,000 lbs) all with a three-year minimum requirement. Table 37 shows the number of gear switching vessels that would be affected (i.e. not received an endorsement under that criteria), the combined maximum and average amount of sablefish north that was landed by each of those vessels in any year, and the resulting percentage of the 2020 allocation that would be taken by the combined maximum or average landings.

In addition, based on the analyses above and in order to display a wide range, three scenarios were analyzed for a yearly landing limit for those vessels that would not qualify for an endorsement: 6,000 lbs, 25,000 lbs, and 125,000 lbs. The 6,000 lbs and 25,000 lbs limits were both based on the bootstrap analysis of non-sablefish gear switching trips (Table 37). 6,000 lbs is near the median of the bootstrap simulation and represents about 0.1% of the 2020 allocation while the 25,000 lbs limit represents the 99th percentile of the bootstrap and is about 0.5% of the 2020 allocation. The final limit of 125,000 lbs was based on the average amount of sablefish caught with fixed gear by those vessels that also trawled and represents about 2% of the 2020 sablefish north allocation (Table 37). For perspective, the annual vessel limit for sablefish north in 2020 is 261,592 lbs (4.5%).

Each projection was produced as follows: Each vessel that did not qualify under that row's endorsement criteria was assumed to take the higher of their average landings or the proposed limit. In other words, under the 25,000 lb limit, if a vessel that didn't qualify under that row's criteria landed less than 25,000 lbs of sablefish north with fixed gear on average, then they would continue to land that average. If the vessel landed over 25,000 lbs on average, then they would be assumed to take the 25,000 lb limit. For all projections, the total projected landings and the percentage of the 2020 allocation is provided.

It is important to consider that some of these vessels that are considered "affected" may no longer be active in the fishery and therefore the projected take and other landings metrics are likely high. However, there may also be new entrants into the fishery that may participate in gear switching in the future, which may operate at levels near or above the historically active vessels or may increase the number of participating vessels landing a non-endorsed limit.

Table 37. Impacts of three endorsement scenarios with projected landings under a 6,000 ,25,000 , and 125,000 lb landing limit of sablefish north with fixed gear.

Endorsement	Number of Gear Switching Vessels that Would Not Qualify	If each vessel lands max in any year…		If each vessel lands average in any year…		6,000 Lb Limit		25,000 lb Limit		125,000 lb Limit	
		Total QPs that would be gear switched	Total % of 2020 Trawl Allocation	Total QPs that would be gear switched	Total % of 2020 Trawl Allocation	Projected landings	Projected total % of 2020 Trawl Allocation	Projected landings	Projected total % of 2020 Trawl Allocation	Projected landings	Projected total % of 2020 Trawl Allocation
15,000 for 3 years	21	1,498,880	25.78	1,381,301	23.76	112,908	1.94	384,216	6.61	1,248,818	21.48
30,000 for 3 years	25	1,662,801	28.6	1,493,768	25.7	136,908	2.36	473,082	8.14	1,361,286	23.46
70,000 for 3 years	30	2,309,883	39.74	1,849,245	31.81	166,908	2.87	598,082	10.29	1,716,763	29.53

To further understand how each limit and endorsement combination would impact the universe of affected vessels, Figure 26 below shows a cumulative distribution of the average amount of sablefish landed by fixed gear for those vessels that would not receive an endorsement under the 15,000 lb for 3 years criteria. The blue vertical line (left most) represents the 6,000 lb limit, the red line (middle) represents the 25,000 lb limit, and the green line (right most) represents 125,000 lbs. Overall, the 6,000 lb limit would cover the average fixed gear sablefish landings for ~14 percent of non-endorsed gear switching vessels, a 25,000 lb limit would accommodate ~38 percent of vessels, and the 125,000 lb limit would allow for average landings by approximately 76 percent of affected vessels.

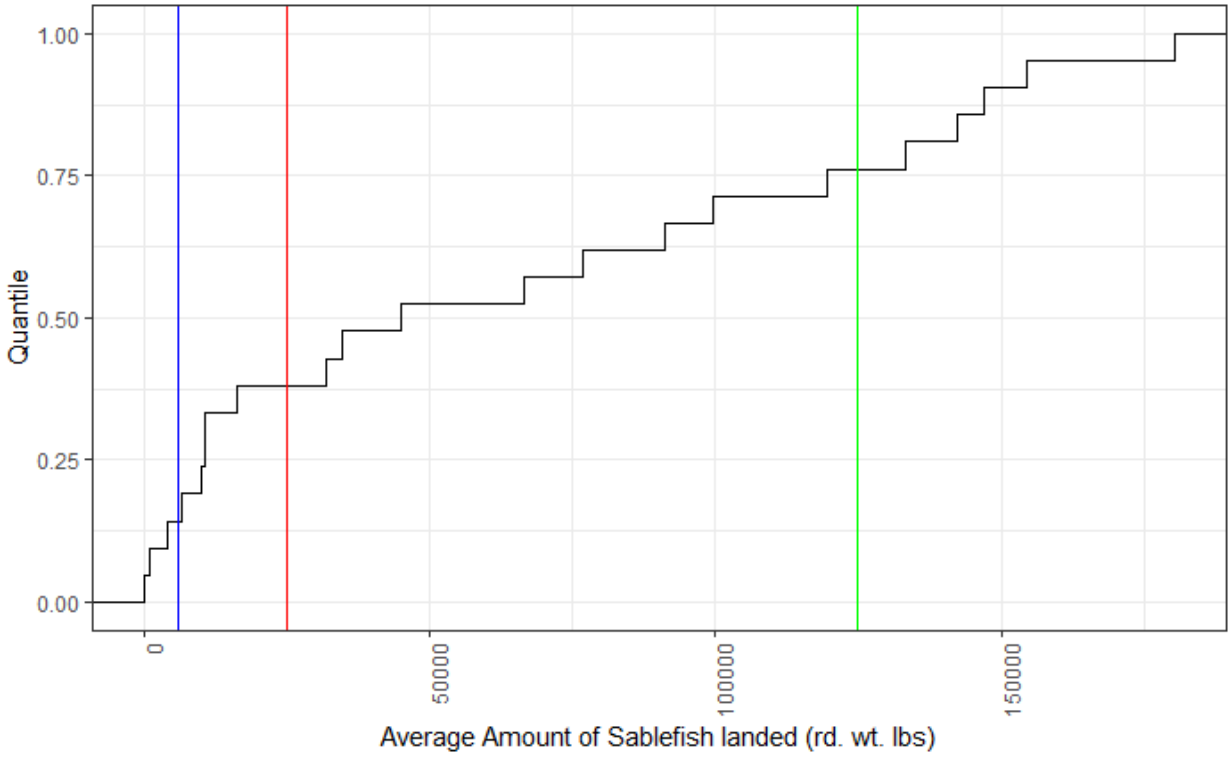

Figure 26. Distribution of the average amount of sablefish landed in a year by vessels that would not qualify for an endorsement under the 15,000 lbs for 3 years criteria. The vertical lines represent: 6,000 lbs (blue--left most), 25,000 lbs (red--center), and 125,000 lbs (green--right most).

Alternative 4: Single Landing Qualifying Requirement and Gear Switching Limits

Alternative 4 is similar to Alternative 3 in that it would create an endorsement for gear switching; however, unlike Alternative 3, only a single fixed gear landing of sablefish north would be required by the qualifying entity (vessel or permit) between 2011 and the control date. Additionally, those without an endorsement would be required to discard. The LE permit (or the one associated with the vessel at the time of implementation) would be granted the endorsement and it is fully transferable with the permit.

Several qualification criteria are presented above under the discussion of Alternative 3. If the SaMTAAC were to consider Alternative 4 without any additional criteria, the potential impacts would be shown under the first row (i.e. one landing in one year) of Table 27 if the permit were the qualifying entity or Table 28 if the vessel were the qualifying entity. The SaMTAAC may want to consider if there would be a single minimum year landing requirement. For example, Table 27 shows that three permits would not meet the 15,000 lb landing criteria even with only a one year minimum requirement. If the vessel were the qualifying entity, seven vessels would not meet the lowest criteria of 15,000 lbs landed in a single (Table 28).

For vessels with endorsements, there would be no individual vessel gear switching limits (i.e. the 4.5 percent annual northern sablefish limit applies as under status quo). However, vessels without a sablefish endorsed permit would be required to discard. Given that the current alternative requires only a single landing to get an endorsement, there would likely only be additional discard if vessels were attempting to gear switch for non-sablefish species and could not lease or acquire an endorsed permit at an economically viable price. Using the analysis presented above for non-sablefish gear switching trips, these vessels have averaged about 2,050 lbs of sablefish landings per trip. Using the discard mortality rate of 20%, this would equate to about 410 lbs of sablefish mortality per trip. In terms of revenue, the value of the discards (if they had been retained) be up to $4,540 in ex-vessel revenue on average (Table 35).