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**West Coast Groundfish Trawl Catch Share Program  
Five-year Review – Draft**

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# Executive Summary

## INTRODUCTION

More than 100 species are monitored or actively managed under the Pacific Coast Groundfish Fishery Management Plan (FMP) and harvested in commercial, recreational, and tribal fisheries off the coasts of Washington, Oregon, and California. The commercial fishery described below does not include tribal activities.

In 1994, the Pacific Fisheries Management Council (Council) amended the FMP to cap the number of groundfish permits with limited entry endorsements for trawl, pots, and longlines. The fishery still includes an open access component for pots, longlines and other non-trawl gears. From 1999 to 2002, nine stocks were declared overfished (Pacific ocean perch [POP], bocaccio, lingcod, canary rockfish, cowcod, darkblotched rockfish, widow rockfish, yelloweye rockfish, and Pacific whiting), and the groundfish fishery was declared a disaster; in 2003, Congress financed a \$46-million, capacity-reducing, buyback loan for permanent removal of 91 vessels (35 percent of permits) from trawl and associated fisheries. A tenth stock, Petrale sole was declared overfished in 2010.

In 2011, under Amendment 20 to the groundfish FMP, the limited entry trawl sector of the commercial fishery transitioned to catch shares management, a type of limited access privilege program under the Magnuson-Stevens Fishery Conservation and Management Act. The catch share program consists of cooperatives for the at-sea mothership and catcher-processor fleets that target and process Pacific whiting at sea, and an individual fishing quota (IFQ) program for the shorebased trawl fleet that targets both Pacific whiting and a wide range of other groundfish species. By law, this type of program must be reviewed five years after implementation. This review will provide managers with information to determine if the program goals are being met.

This executive summary addresses four main topics to assess the effectiveness of the program:

1. Changes in the net benefits to the nation
2. Financial outcomes for fishery participants
3. Distribution of cost, revenues, effort, and net benefits among fishery participants
4. Changes in utilization rates of available fish species under the catch share program

## BASELINE AND CATCH SHARE IMPLEMENTATION PERIOD CONTEXT

Ideally, this review would compare outcomes of the program to how the fishery would look without it. However, numerous factors influence the fishery and its value, including geopolitics, changes in world markets, substitute seafood products, production inputs, environmental conditions, changes in stock status and catch limits for target and coincidentally caught species, and incentives created by management of other fisheries. It is difficult to distinguish the direct effects of the catch share program from the many ways in which the trawl fishery has changed over the last five years.

One major factor affecting the baseline period and the period of the catch share program is the high natural variability in Pacific whiting biomass and its corresponding total allowable catch (TAC). During the Economic Data Collection (EDC) baseline period (2009-2010) and the Pacific Coast Groundfish Social Survey (PCGFSS) baseline (2010), the average TAC for whiting was about 70 percent of a 1995 to 2015 average. In contrast, average TAC since implementation (2011 to 2015) was about 120 percent of the 1995 to 2015 average, about a two-thirds increase from the baseline. This increase, coupled with the importance of whiting to the overall fishery (on average, 50 percent of all ex-vessel revenue) has a major effect on nearly all analyses. Longer time series of other datasets, such as state fish tickets, are used where possible to construct baseline periods for comparison.

## RESULTS

### 1. HOW DID NET BENEFITS TO THE NATION DERIVED FROM THIS FISHERY CHANGE AFTER IMPLEMENTATION OF THE CATCH SHARE PROGRAM?

The Council anticipated net economic gains from the implementation of Amendment 20, primarily through increases in productivity and efficiency resulting from consolidation and increased flexibility, as well as through higher product volume and prices (3.1.1).

#### NET BENEFITS

Between 2011 and 2015, annual net benefits to the nation (measured by annual net revenue or revenue minus costs for all sectors of the fishery) was \$54 million, more than double the 2009-2010 baseline average of \$25 million. Total net benefits across all sectors were highest in 2014, at over \$77 million, and lowest in 2015 at \$26 million. The largest growth in net benefits came from the catcher vessel sector, and the largest contributor to net benefits was the catcher-processor sector (3.1.1(a)).

#### CONSOLIDATION

The Council expected that consolidation would be a major driver of increases in net benefits.

The number of catcher vessels active in the fishery has decreased from the baseline to the present, ranging from 134 vessels in 2009 down to 97 in 2015. The shoreside Pacific whiting fleet has consolidated slightly more (29 percent) than the non-whiting catcher vessel fleet (24 percent). The number of at-sea catcher vessels fishing for Pacific whiting has remained relatively constant, as has the number of motherships, which is capped by the number of mothership limited entry permits(3.1.1(b)(1)).

In the catch share program, a first receiver site license is required to receive shoreside catch share deliveries. The number of shorebased processing companies purchasing Pacific whiting and non-whiting species decreased from an average of 12 in 2009-2010 to an average of 8 from 2011 to 2015. The number of shorebased processing companies purchasing non-whiting species exclusively remained relatively constant (3.1.1(b)(1)). However, the number of buyers has decreased since the 1990s. Public comment and social surveys indicate that this level participation reflects an increased rate of consolidation in ownership and concentration of control of quota share, fishing businesses, processing capacity, and support infrastructure (3.2.2(g)(4)(c)).

To restrict consolidation in the shoreside catch share program and mothership co-ops, the Council put limits on the percentage of quota share (the long-term harvest privilege) that entities in those sectors may control. Additionally, limits were put on the amount of annually issued quota pounds that a shoreside vessel may use and hold, the annual amounts that a mothership catcher vessel may deliver, and the annual amounts that a mothership may process. Most vessel account and quota/catch history share owners do not currently appear constrained by these limits (3.1.1(b)(1)(A)). A moratorium on transfers of quota shares during the first three years of the program may have delayed some anticipated consolidation of ownership. No limits were placed on catcher-processor consolidation as long as the co-op remains in place.

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## FLEXIBILITY

The Council expected that the catch share program would increase participants' flexibility in many aspects of the fishery. There is substantial evidence that participants are taking advantage of increases in flexibility. Harvesters and processors have adjusted to the catch share program by altering their participation in non-catch share fisheries (3.1.2(d)(1), (3.2.2(g)(5)), days at sea (3.1.2(d)(1)), the timing of landings (3.1.2(d)(2)), the number and size of fishing trips (3.1.2(d)(2)), the location of landings (3.2.2(b)), participation in cooperatives and risk pools (3.2.2(g)(2)), diversification (3.1.2(d)(5), gear switching (3.1.2(d)(6), 3.2.2(g)(4)(a)), carryover of quota (3.1.2(d)(7)), and exiting the fishery (3.2.3(d)).

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## PRODUCTIVITY AND EFFICIENCY

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### WHITING

Efficiency (calculated as net revenue as a percentage of total revenue) among shoreside and at-sea whiting catcher vessels increased from the baseline period until 2015. However, in the shoreside whiting fishery, productivity (measure of output per unit of input calculated as an index that accounts for growth in biomass) declined 29 percent in the same period. For whiting processors, efficiency (net revenue as a percentage of total revenue; it cannot be biomass-adjusted) has increased substantially since the beginning of the catch share program, with the exception of 2015. Efficiency for all whiting sectors decreased in 2015 due to low attainment (utilization of allocation) of whiting and difficult fishing conditions (3.1.1(b)(2)). Catcher-processors are more efficient than other sectors; this has not changed since the catch share program began. There is no clear trend in efficiency for motherships.

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### NON-WHITING

Non-whiting vessels experienced a substantial increase in efficiency from the baseline period (8 percent) to the catch shares period (averaging 18 percent, with a high of 23 percent in 2015). The productivity index for the non-whiting groundfish trawl sector increased by 35 percent over the same period (3.1.1(b)(2)). For non-whiting processors, there has been a downward trend in processing efficiency because of increasing labor expenses as well as other costs.

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## PRODUCT VALUE

The Amendment 20 Environmental Impact Statement (EIS) predicted that elements of the catch share program might contribute to improvements in product quality and prices. The average value of at-sea whiting production per metric ton (mt) declined from the 2009-2010 period to the 2011 to 2015 period by about 15 percent in the mothership sector and 8 percent in the catcher-processor sector. Production value per pound in the Pacific whiting shoreside sector echoes this trend. However, most other species experienced slight to moderate increases in average production value per pound in the shoreside sector, including in the economically significant frozen sablefish (particularly with high prices in 2011) and fresh Dover sole product categories (3.1.1(b)(3)).

Seafood certification and labeling programs help inform consumers. The West Coast groundfish limited entry trawl fishery was certified as a sustainable fishery by the Marine Stewardship Council in 2014 (the Pacific whiting fishery was certified in 2010). The Monterey Bay Aquarium's Seafood Watch Program promoted several major species from "avoid" to either "best choices" or "good alternatives." Both designating entities indicated that their findings had been based on management changes in the groundfish fisheries, including the catch share program and its

stringent monitoring requirements. These designations may lead to increased consumer awareness and preference for West Coast groundfish in the future (3.1.1(b)(3)).

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## CONSERVATION BENEFITS

One of the primary intentions of Amendment 20 was to reduce bycatch and discard mortality for all species (3.3.2). The vessel-level accountability provided by catch shares has resulted in significant reductions in the catch of overfished species and the amount of bycatch discarded, exceeding Council rebuilding goals for overfished species (3.3.2(a)). When Amendment 20 was implemented, of the ten previously mentioned overfished species only lingcod and Pacific whiting had been rebuilt. With the implementation of the catch share program, total fishing mortality decreased for darkblotched rockfish, POP, and cowcod rockfish, largely due to the drastic decline in discards (e.g., from more than 200 mt to less than 5 mt for darkblotched).

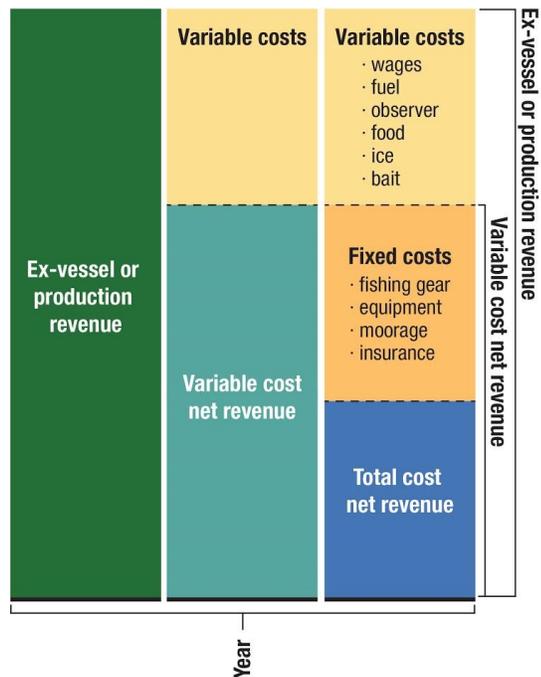
Discards of six of the seven overfished rockfish species dropped at least 90 percent after implementation of Amendment 20 (3.3.2(a), Appendix A). For all six of these, bottom trawl gear accounted for 90 percent or more of the discards prior to 2011. The exception, widow rockfish, is more pelagic than the other overfished rockfish species and, thus, can be commonly caught (and even targeted) in midwater trawl gear, especially in the whiting directed fishery. Widow rockfish was declared rebuilt in 2012, with the Council electing to continue precautionary low harvest levels through 2016. Pacific halibut may not be retained by most West Coast groundfish trawl vessels (shoreside whiting vessels may surrender it at the dock), and each fisherman is provided a limited amount of halibut individual bycatch quota (IBQ) to account for discard mortality. After implementation of the catch share program, the amount of halibut discarded decreased significantly from an annual mean of 319 mt before the program (2002 to 2010) to 76 mt after the program (2011 to 2015) (3.3.2(a)). These changes suggest that fishermen have either adjusted fishing methods to decrease catches of these species, or decreased effort using gears that catch these species. Possible explanations include changes in location, timing, gears, excluder devices, or move-on rules (requirements to change fishing location). While halibut bycatch has declined, allocations of some overfished species have substantially increased with rebuilding, and vessels have increasingly elected to target these species within the limits of the rebuilding plan (3.3.2(a)).

There can be a tradeoff between bycatch of constraining rockfish species and bycatch of Chinook salmon, the highest bycatch salmonid in West Coast groundfish fisheries. Most Chinook bycatch is from midwater trawls in the whiting sectors. The whiting fishery risks closure if overfished rockfish limits are exceeded, whereas approaching chinook thresholds restricts only fishing shallower than 100 fathoms (triggered in 2014). Some participants have reported prioritizing rockfish avoidance over salmon. Catch within whiting sectors has increased, from an average of 5,727 Chinook (2002 to 2010) to 6,958 (2011 to 2016) after

implementation of the catch share program. Increases reflect both increased whiting TAC and the post catch share shift of shoreside and mothership sector effort towards the fall, with Chinook bycatch rates highest from September through December.

Observed interactions with marine mammals and seabirds have increased on par with the increase in observer coverage. Increased effort with fixed gear in the program may lead to increased impacts on humpback whales, western gulls, and black-footed albatross populations.

**2. HOW DID FINANCIAL OUTCOMES FOR PARTICIPANTS IN THE FISHERY CHANGE FOLLOWING CATCH SHARE PROGRAM IMPLEMENTATION?**



Financial outcomes for participating vessels and processors are measured using variable cost net revenue, a representation of operating profits that accounts for the unfixed costs (fuel, crew, ice) of production only, and total cost net revenue, a representation of cash-flow profitability that considers fixed costs (e.g., purchase of a new engine or processing machinery) and variable costs (3.1.2(a)(1)) (Figure ES-1). Summary statistics describing profitability such as means, standard deviations, and medians are used to represent the performance of vessels or processors.

**CATCHER VESSELS**

Mean total cost net revenue and variable cost net revenue increased on average for shoreside whiting

and at-sea whiting activities, as did total cost net revenue and variable cost net revenue per ton, except for 2015. Difficult fishing conditions and low attainment for whiting in 2015 affected the profitability of all whiting sectors. Mean total cost net revenue and variable cost net revenue have also increased for non-whiting trawl activities. For non-whiting trawl gear operations, mean and median total cost net revenue, as well as mean and median total cost net revenue per day, have more than doubled (on average) since 2009 and 2010 (Table ES-1). The percentage of catcher vessels with negative total cost net revenue has decreased from an average of 35 percent prior to the catch share program to 27 percent (for non-whiting catcher vessels) and 24 percent (for whiting catcher vessels) after.

Costs per fishing day have increased on average. Wages and fuel make up 75 percent of variable costs, and average costs on crew and captains’ wages per fishing day have increased in most ports. Fuel costs per day have increased as well, although they have risen most

dramatically in ports with a high proportion of whiting vessels due to higher catch limits and higher fuel prices in 2011-2012.

Observer costs were not paid by the fleet prior to the catch share program. As part of the program implementation, observer coverage was increased to 100 percent, and the costs related to putting observers on the vessel were charged to the industry. To ease the transition to 100 percent coverage, a federal subsidy was implemented in 2011 (\$328 per day), which decreased each subsequent year (ending at \$108 per day in 2015). Starting in 2016, vessel operators began paying the full cost for their monitoring. The average monitoring cost (observer costs and electronic monitoring) was \$402 per day in 2015, which was about 4 percent of the revenue in 2015.

The shoreside whiting fishery began using electronic monitoring of incidental catch as part of an exempted fishing permit beginning in 2004; this permit ended with the implementation of the catch share program. On-the-water electronic monitoring was subsequently reintroduced as an alternative to observer coverage for catch shares. Thirty-four percent of vessels started using electronic monitoring under an exempted fishing permit in 2015, this number increased to 42 percent in 2016 (3.1.2(a)(1)).

Net revenue with quota costs included is analyzed as a “lower bound” of net revenue. For non-whiting catcher vessels, the percent difference between variable cost net revenue with and without quota costs included varied by year, from a low in 2012 (mean variable cost net revenue was 0.5 percent lower with quota costs included) to a high in 2015 (mean variable cost net revenue was 25 percent lower with quota costs included). In 2015, the median non-whiting vessel spent 7 percent of its revenue on quota. For whiting catcher vessels, the percent difference between variable cost net revenue with and without quota included ranged from 4 percent in 2012 to 10 percent in 2015. In 2015, the median whiting vessel spent 3.2 percent of its revenue on quota (3.1.2(a)(2)).

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## MOTHERSHIPS

Total cost net revenue and total cost net revenue per ton have decreased on average in the catch share period compared to the baseline. Average total cost net revenue per mt was negative in 2012 and 2015 for motherships. Average total costs may be strongly influenced by heavy investments made in a year (particularly when there are only a few vessels). Average variable cost net revenue per metric ton was positive for each year, but lower than the pre-catch share period (3.1.2(a)(1)). Some mothership vessels and catcher vessels that deliver to motherships have common ownership. This means that the earnings from the catcher vessels may be shared by motherships; therefore, in some cases, net revenue for motherships alone may not be the most accurate representation of profitability.

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## CATCHER-PROCESSORS

Profitability of individual catcher-processors has fluctuated across years, with little change in the overall average, comparing 2009-2010 to the catch share period (2011 to 2015). Mean variable cost net revenue and total cost net revenue per vessel were highest in 2010 and 2014.

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## SHORESIDE PROCESSORS (WHITING AND NON-WHITING)

For the processing sector, financial outcomes differed dramatically depending on whether the company purchased and processed Pacific whiting in addition to non-whiting groundfish species. For whiting processors, average total cost net revenue and average variable cost net revenue increased dramatically beginning in 2011, with the exception of 2015. While annual catch limits, thus volume, of Pacific whiting were higher compared to 2009 and 2010, total cost net revenue per ton of Pacific whiting was still higher in the catch share period, although this was partially due to high fixed cost expenditures (e.g., equipment) in the pre-catch share period. Variable cost net revenue per mt of production has decreased for whiting processors.

For processors that do not handle Pacific whiting, average total cost net revenue and average variable cost net revenue has decreased steadily since 2012, with lows in 2014 (3.1.2(a)(1)). The average total revenue and the variable cost net revenue earned per non-whiting processor have decreased (50 percent and 34 percent, respectively) since catch share implementation, despite potential increased harvest possible due to rebuilding stocks, moderate increases in average product prices for most species, and enhanced public perception of the fishery. Processors report that their profits have been affected by difficulties keeping workers steadily employed due to the instability of groundfish landings, which makes it more difficult for the processors to provide a steady supply of groundfish to retailers (3.2.2(g)).

While there is little evidence that the coastwide timing of landings has changed, the total number of trips and how many days an individual processor receives deliveries have generally decreased, and the average delivery size has increased (3.1.2(d)(2)). There had been an expectation that catch shares would give processors an opportunity to work with harvesters to respond to economic factors, taking into account needs for stability and reliability of product flow. However, some PCGFSS respondents view the catch share program as having exacerbated problems related to stability and reliability, particularly in communities that have experienced a decline in landings (3.2.2(g)).

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## CREW AND PRODUCTION WORKERS

Since implementation of catch shares, full-time employment in the groundfish fishery has decreased, part-time employment in the groundfish fishery has slightly increased, and full-time employment in other (non-groundfish) fisheries has increased among crew participating in the

catch share program (3.2.2(f)). In general, participants perceived a tight link between the catch share program and changes in the availability, stability, and compensation of jobs in the groundfish trawl fishery. While there was general agreement that the number of employment opportunities tied to the groundfish trawl fishery have decreased, there were varied perspectives on impacts to job stability and compensation (3.2.2(f)).

Compensation for individual crewmembers on whiting vessels increased dramatically (while fishing in the catch share fishery) relative to 2009-2010, with the exception of 2015. Average daily wages have increased 83 percent, and average annual wages have increased 118 percent since 2011. Average daily and annual compensation for individual crewmembers on non-whiting vessels has increased modestly (63 percent and 24 percent, respectively). Since 2010, fewer crewmembers rated compensation amount as “poor” and more rated it as “excellent” in the PCGFSS, although the perspective of crew who have been displaced from the fishery is likely underrepresented in the social survey and not represented by EDC data.

Annual wages paid to processing and non-processing crew on motherships were higher in all catch share years compared to 2009 and 2010. Increases in annual wages reflected the increase in catch limits and days at sea, while daily wages paid to mothership crewmembers have, for the most part, decreased slightly. Average and daily wages for processing crew on catcher-processors have decreased by 23 percent and 20 percent, respectively, since the implementation of catch shares, but average annual and daily wages for non-processing crew have increased considerably.

For shorebased processors, employment has become more evenly distributed throughout the year, with fewer employees during former peak months, and more during the rest of the year. Average hourly compensation of non-production employees and production workers, including non-groundfish, has increased on average (3.1.2(a)(3)).

### 3. DID THE DISTRIBUTION OF COST, REVENUES, EFFORT, AND NET BENEFITS AMONG FISHERY PARTICIPANTS (INCLUDING COMMUNITIES AND USER GROUPS) CHANGE?

Several outcomes of the catch share program have been consistent with expectations. These outcomes include increased net benefits, consolidation, and efficiency, as illustrated by average outcomes for both individuals and for sectors. However, tradeoffs exist between maximizing economic benefits and avoiding negative consequences, such as excessive consolidation. Such consequences can be seen through changes in the distribution of costs, revenues, effort, and net benefits across fishery participants.

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**BY USER GROUP**

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**CATCHER VESSELS**

Individual economic performance varies widely among participants. Of the catcher vessels that participated in the limited entry trawl groundfish fishery in 2009 and 2010 and continued to participate in the IFQ program, 53 percent experienced an increase in mean annual variable cost net revenue. The average vessel experienced a 60 percent increase in variable cost net revenue.

The concentration of harvesting-related revenue in the non-whiting sector increased during the 2011 to 2015 period. This indicates a smaller number of vessels account for an increasing share of fleet revenue. Among all whiting catcher (shoreside and mothership) vessels, revenue concentration has roughly stayed the same level and is less than among non-whiting catcher vessels (3.1.1(b)(1)).

**GEAR SWITCHING AND SABLEFISH**

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When the Council implemented the shorebased IFQ program, it included a provision allowing participants with a trawl endorsed limited entry permit to fish their quota pounds with either trawl or any other legal groundfish gear, referred to as “gear switching.” In practice, most vessels that have taken advantage of this provision are those that employed fixed gear (pots and longlines) prior to 2011 and that typically have targeted sablefish. Sablefish generally has a higher ex-vessel price when caught with fixed gear. The gear-switching provision was intended to allow more flexibility for each vessel to choose its most profitable fishing strategy. The provision was also provided for environmental reasons, as fixed gear was thought to have fewer habitat impacts and minimal bycatch.

Sablefish, although a single coastwide stock, is managed with separate annual catch limits north and south of 36° N. latitude. Quota shares were allocated separately for northern and southern sablefish. The total quota issued each year, participation, and quota pound utilization in the northern sablefish fishery are higher than in the southern fishery. From 2011 to 2014, the average utilization for northern sablefish was 93 percent, but for the southern quota, it was only 43 percent.

In the years since implementation, an average of 16 vessels has taken advantage of the gear-switching provision each year. An average of six vessels switched from using trawl to using fixed gear at least part of the year. The number of gear switchers has decreased since 2011 from eight (2012) to five (2013 to 2015). An additional ten vessels, on average, that had not previously fished in the limited entry trawl fishery, called “enterers,” purchased or leased trawl permits and quota to fish with fixed gear in the IFQ program from 2011 to 2015. Gear switchers

accounted for an average of 7 percent of northern sablefish quota, and enterers represented 21 percent, with trawl gear using an average 64 percent of quota (3.1.2(d)(6)).

In the southern sablefish fishery, participants in the IFQ pot and non-IFQ hook-and-line fisheries have reported new conflicts in southern California. Non-IFQ fishermen have reported increased pressure in their local fishing grounds from vessels that have not traditionally fished south of 36° (3.2.2(g)(5)). There is evidence to support this for the area between Point Lopez and Point Conception, where spatial analysis indicates IFQ pot locations covered 65 percent of the partially observed non-IFQ hook-and-line locations. In comparison, south of Point Conception (34°27' N. latitude), less than 1 percent of observed non-IFQ hauls directly overlapped with the location of IFQ hauls over the same periods (3.3.4(b)).

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## SHOREBASED PROCESSORS

### WHITING

On average, revenues are shared more equally among remaining whiting processors compared to before the catch share program. This is caused by both the non-participation of smaller processors and a redistribution of revenues among remaining processors. Per mt, average variable costs declined likely due to high processing volumes following increased whiting TAC.

### NON-WHITING

On average, the concentration of net revenue among non-whiting processors has not changed catch share since implementation. Median net revenue is much lower than the mean, indicating that few non-whiting processors have net revenue much higher than the mean, but most have net revenue lower than the mean.

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## QUOTA SHARE LESSEES AND OWNERS

The catch share program created a new type of fishery participant: a quota share owner. Quota share owners have the option to lease their annual quota pound allocations to other participants (3.1.2(d)(3)). This type of fishery participant earns income from the fishery, while avoiding some of the risks and costs of direct participation. While some benefit from this new arrangement, other vessel operators dependent on acquiring quota pound through annual leases have reported that this indirect participation as destabilizing (3.1.2(d)(3), 3.2.2(f)).

In an IFQ program, as consolidation increases, the vessels that remain in the fishery will likely spend a larger portion of their revenue on quota share purchases and/or leases of quota pounds from quota share owners who have exited or who fish less in the catch share program. The data suggest that this is occurring for both whiting and non-whiting vessels, but for non-whiting vessels to a greater extent (3.1.2(a)(2)), coinciding with general increases in revenue.

As part of the catch share program, 20 percent of the initial shoreside Pacific whiting quota allocation was given to eligible shorebased processors. Some companies also received share allocations for other species through affiliated ownership of trawl permits. In 2014, NMFS lifted the moratorium on quota share ownership transfers and required divestiture of shares in excess of caps toward the end of 2015. Since quota share trading started, whiting quota share ownership by processors has increased from 20 percent to 23 percent in 2016. These processors (originally allocated whiting quota) currently own quota shares for many non-whiting species. There is evidence that shorebased processors use their quota to support bargaining relationships with vessels to secure deliveries (3.1.2(a)(2)). For the catcher-processor and mothership sectors, trading and leasing of harvest rights occur through private formal or informal contractual lease arrangements, are not disclosed to NMFS, and are, therefore, not analyzed in this report.

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## BY COMMUNITY

The Council expected disparate employment and participation impacts along the coast following implementation of Amendment 20 (3.1.1). Port areas with more vessels making trawl landings (including shorebased whiting) after 2010 include south and central Washington Coast ports (aggregated to preserve confidentiality), Astoria/Tillamook, Newport, Coos Bay, Brookings, Fort Bragg, San Francisco, Monterey, Morro Bay, and Santa Barbara (3.2.3(d)(3)). Participants felt that ports in Oregon had adapted most successfully to the catch share program compared to those in other states. Newport, Oregon, appears to be adapting well to the catch share program, in part because the diversity of its fisheries and its robust infrastructure supporting adaptability to a range of management or environmental changes (3.2.2(g)(1)(b)).

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## DISTRIBUTION OF REVENUE AND BUYERS AMONG PORTS

Since the 1990s, the number of groundfish (whiting and non-whiting) buyers has declined across all ports. Overall, the greatest decline in the number of buyers occurred in California ports.

Two additional indicators of changes across ports since catch share implementation are distribution of volume and the ex-vessel revenue of groundfish landed. Trawl ex-vessel revenue varies, with no clear trend over time. In general, for non-whiting landings, each port area's share of the coastwide total ex-vessel volume and corresponding revenue did not vary. With the increases in whiting total allowable catch since catch shares were implemented, ports in the south and central Washington coastal areas (Ilwaco and Westport), Astoria, and Newport show higher volumes of landings, driving corresponding higher ex-vessel revenue. Historically lower-volume port areas continued to experience declines, and four low-volume port areas (Bodega

Bay, north Washington Coast, other Washington ports, and Tillamook) that had historically purchased limited entry trawl groundfish no longer did so in the catch share period.

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## ENGAGEMENT

Engagement is a measure of the level of fishery participation (commercial fish landings, permit holdings, and vessel ownership) in a community, relative to the coastwide participation in that fishery. From a baseline three years prior to implementation, to the first three years of the program, engagement levels stayed constant in most communities. Exceptions were Crescent City and Coos Bay, which had the largest percentage decrease in groundfish engagement relative to other ports, and Ilwaco, which increased by a larger percentage than other communities. (3.2.2(e)).

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## INFRASTRUCTURE

A functioning fishing industry requires adequate infrastructure, including harbor facilities, routine dredging, providers of fishing gear and vessel maintenance, access to ice and bait, buyers and processors, and the providers and services required by buyers and processors. To the extent that anticipated participation consolidates around fewer centers of activity, shorebased resources may concentrate in fewer locations. In many ports, infrastructure loss began with overfished species declarations and subsequent buyback (see Introduction). Washington respondents reported few infrastructure losses in the catch share period, but they identified a reduction in the number of processors. Oregon respondents identified losses that occurred after implementation, with consolidation and centralization of fish activity in Newport and Astoria. Participants noted that California's trawl infrastructure appears to be shrinking, with significant losses along the southern and central coast of California (3.2.2(c)).

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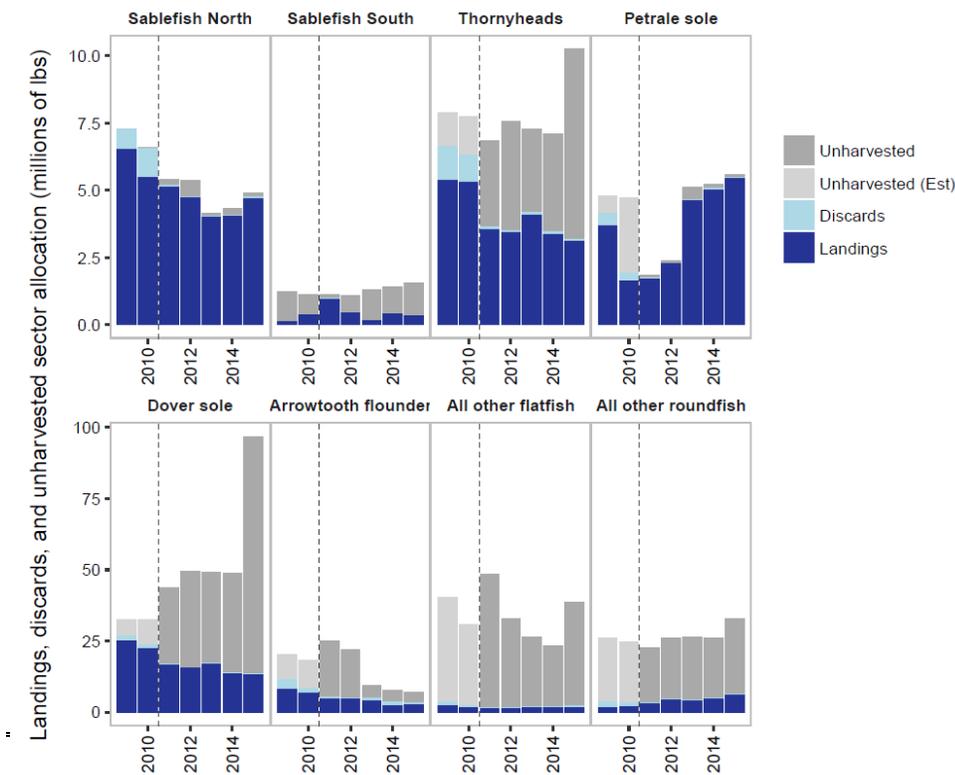
## PUBLIC CONCERNS ABOUT THE DISTRIBUTIONAL IMPACTS OF PROGRAM COSTS

Participants in the groundfish trawl catch share fishery believe that the cost recovery fee and the costs of 100 percent on-the-water and offload monitoring can reduce profitability, and they may even discourage investments in capital repair or improvement. Cost recovery fees amounted to 3 percent of revenue in 2014-2015 for shoreside catcher vessels (3.1.2(a)(1)). Some fishermen reported that the monitoring requirement and associated costs disadvantage smaller vessels, which pay monitoring costs disproportionate to their revenue (3.2.2(g)(5)). The cost of observers was seen by many fixed-gear and small-vessel fishermen as a significant barrier to profitable participation in the groundfish trawl fishery. With the sunset of government reimbursements, the cost of observer coverage has increased from 1 percent of revenue (in 2011) to 4 percent of revenue (in 2015) for non-whiting operations, and from less than 1 percent of revenue (in 2011) to 2 percent of revenue (in 2015) for whiting operations (3.1.2(a)(1)).

Participants in California and southern Oregon have indicated that, with the decrease in vessels fishing, expenses (including travel reimbursements) for monitoring have increased. Observer companies cannot profitably maintain enough observers in each port to accommodate multiple trawl vessels that may want to fish a few days a month during good weather windows. Both vessels and processors in these areas have noted that electronic monitoring exacerbates both costs and scarcity. As vessels switch to (currently subsidized) electronic monitoring, the number of observer days that remaining vessels require decreases, which results in higher prices for those vessels and lower observer availability. All IFQ shoreside offloading activities must have catch monitors, and the observer on a trip often serves as the catch monitor for the offload. Since the vessel's observer is no longer available to act as a shoreside catch monitor for trips monitored with electronic monitoring, processors in lower volume ports pay more for catch monitors.

#### 4. DID UTILIZATION RATES FOR SPECIFIC SPECIES CHANGE FOLLOWING CATCH SHARE PROGRAM IMPLEMENTATION?

Figure ES-2. Landings (dark blue), discards (light blue), and unharvested (grey) trawl sector allocation of non-whiting groundfish species (millions of lbs). If carryover was made available for a specific quota category, the total weight was deducted from the original year and added to the following year. Except for sablefish, there was no trawl-specific quota in 2009 and 2010; for context, Unharvested (Est) (light grey) was calculated for 2009 and 2010 as the annual OY \* (2011 Trawl Sector Allocation)/(2011 ACL) by stock or complex. Source: Somers et al. 2016, IFQ Program Database.



One of the goals of Amendment 20 is to “provide for full utilization of the trawl sector allocation.” For many species in the program, this goal is far from being met (3.1.3(a)(1), Appendix A).

### NON-WHITING TARGET SPECIES

The non-whiting trawl fleet has used less than 50 percent of its Dover sole allocation since the implementation of catch shares, and this decreased to only 13.5 percent in 2015 with the doubling of the Dover sole annual catch limit. Utilization of allocations for many species of rockfish, roundfish, and flatfish is also far less than 50 percent. Petrale sole and northern sablefish are nearly fully utilized, while the southern allocation of sablefish is not (Figure ES-2). It is difficult to evaluate changes in utilization rates strictly, as there were no formal, species-level, non-whiting allocations to the trawl sector with the exception of sablefish north of 36°N. latitude prior to the catch share program.

Numerous economic and social factors contribute to the current and ongoing underutilization of trawl allocation for many species included in the non-whiting sector of the trawl fishery. Figure ES-3 illustrates how processors, catcher vessels, and markets are connected in a cycle that includes low utilization of groundfish stocks. Low utilization contributes to a smaller and/or

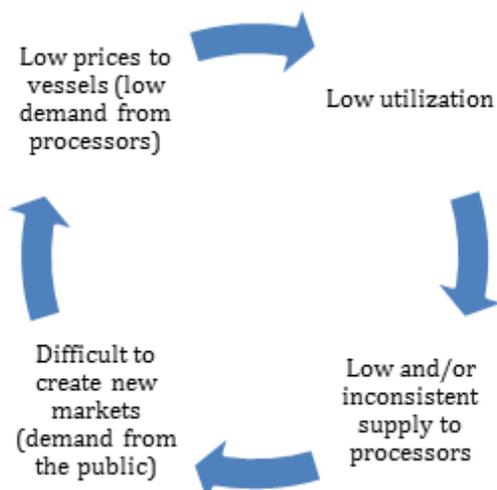


Figure ES-3. Illustration of cycle of low demand and low utilization.

inconsistent supply to processors. Without a predictable supply, processors have a difficult time securing premium markets (fresh, for example) and, instead, may have to rely on less discriminating protein markets that offer lower prices. Increased flexibility for vessels and limited communication between vessels and processors about production plans can contribute to inconsistent supply to processors, making it difficult to employ a labor force ready to process groundfish year-round. Some processors have imposed trip limits on vessels that deliver to them to limit deliveries of species for which they lack processing or marketing capacity. Low demand and corresponding lower prices from processors, in turn, make fishing less profitable and result in fewer trips, lower landings, and ultimately, low utilization. It is difficult to quantify the effect of individual factors on utilization, as they are all related in an endogenous (cyclical) way (Figure ES-3) and are influenced by external factors as well (3.1.3(a)).

One aspect of the multispecies IFQ market that may affect utilization is the challenge of predicting how much of a particular species' quota pounds a vessel will need throughout the year. Vessel operators can likely predict how much target species quota they will require throughout the year, but they may not feel confident in their ability to predict take of bycatch and constraining species. Vessels planning to fish at the end of a year often retain quota in case they need it, rather than risking being able to acquire it should the need arise. The uncertainty of being able to attain quota of overfished species, coupled with the cost of a high-bycatch event for one of these species, makes vessels risk-averse (3.3.3(c-d)). Fishing to avoid constraining species is likely to decrease the attainment of target species. Various quota risk pools were formed between groups of fishermen to reduce the risk that any individual would be shut down due to an unexpected catch event (see 3.2.2(g)(2)).

Despite concerns that the gear-switching provision prevents full utilization of species in the Dover sole, thornyhead, and sablefish (DTS) target fishery, the elimination of the gear-switching provision would not result in full attainment of Dover sole or thornyheads. Northern sablefish quota is the principal constraint on DTS trawl fishing because it is the only target stock in that fishery that approaches full utilization. Using an estimation method involving catch ratios of sablefish with Dover sole and thornyheads, catching all the sablefish allocated to the trawl sector with trawl gear (i.e., the gear-switching provision were completely eliminated) could result in an increase in Dover sole utilization from 13 percent utilized (which was the figure in 2015) to 16 percent. This would be an increase in longspine thornyhead utilization from 23 percent to 32 percent and an increase in shortspine thornyhead utilization from 42 percent to 49 percent (using 2015 quotas). These estimates are lower bounds as they take into account the changes in fishing practices that have occurred due to the scarcity of sablefish quota, which includes implementing practices that increase the amount of other species caught per pound of sablefish. Thus, while utilization of sablefish by the fixed gear fishery has contributed to the decrease in attainment of Dover sole and thornyheads by vessels fishing with trawl gear, the analysis in this review shows that, even without any participation by fixed gear vessels in the trawl sector, utilization rates for these species are not likely to be close to full attainment, especially when the higher quotas starting in 2015 for Dover sole and thornyheads are considered (3.1.3(a)).

Analyses suggest that annual vessel-use quota pound limits do not significantly and directly contribute to low attainment. However, these analyses do not assess whether vessel limits lead to conservative fishing practices to avoid constraining species that result in decreased attainment or prevent the development of boutique target fisheries. Fear of an unanticipated high bycatch event, or "lightning strike," may change behavior and decrease attainment rates because the consequences are so high. For example, if a lightning strike were to occur, vessel limits may force that vessel out of the groundfish fishery for many years.

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## WHITING

Attainment of Pacific whiting was somewhat below the 2014 TAC, and it was far below the 2015 TAC. Many contributing factors are not directly attributable to implementation of catch shares. For example, limited availability of overfished species allocations, combined with increased encounters with rebuilding populations, may have made overfished species increasingly constraining. In addition, low catch per unit effort for whiting was due to anomalous oceanographic conditions (the “warm blob”), and geopolitics have influenced uncertainty in the whiting export market. The flexibility that the catch share program provides allows vessels to apportion their effort strategically between West Coast Pacific whiting and Alaska pollock fisheries to maximize returns. This flexibility can benefit vessels by allowing them to minimize effort in a location experiencing unfavorable conditions, such as the high bycatch or low catch per unit of effort (CPUE) conditions of 2014 and 2015. However, the at-sea catcher vessels depend on motherships that purchase and process their catch at-sea, and the decision for fewer motherships to return to the West Coast late in 2015 may have been detrimental to the utilization of Pacific whiting allocation. Negative impacts on the catcher vessels may have been mitigated by diversification into rebuilt fisheries, because the number of endorsed mother ship/catcher vessels targeting non-whiting stocks with mid-water trawl gear from October to November increased from 2014 to 2015 (3.1.3(b)).

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## PROGRAM MANAGEMENT AND UTILIZATION

Stakeholders expressed concerns about the lag between the Council’s final action on modifications to the catch share program and subsequent implementation into regulations. New, non-routine rules for the groundfish trawl program have taken, on average, slightly more than two years from final Council action to implementation, for ten non-routine program rules from 2011 to 2017 (3.3.3(a)). Public comment references anticipation of increased flexibility in gear use and configuration (on which the Council took final action in March 2016) and increased access to fishing grounds through changes in spatial management such as the rockfish conservation area closures (scheduled for final Council action in September 2017) as regulatory changes that would provide an avenue to increased utilization.

## OTHER CONSIDERATIONS

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### SAFETY

The non-whiting portion of the shoreside fishery was previously managed with a variety of landing limits that did not incentivize fishing in dangerous conditions. In the shoreside and at-sea whiting fisheries (with the exception of the catcher-processor sector, which was already operating as a cooperative), safety improvements related to easing the race for fish (for whiting) were expected with implementation of catch shares. For whiting, effort in both the at-

sea and shoreside fisheries has shifted to later in the year. A similar trend was observed for catcher-processors when it moved to cooperative management in 1997. Approximately 52 percent of whiting fishermen and 41.2 percent of non-whiting fishermen report that safety has improved because of the catch share program. Interview data suggest that this can be attributed to eliminating the race for fish and pre-trip safety checks by observers.

Observer providers charge in 24-hour blocks starting at midnight. As the proportion of the observer costs borne by the vessel has increased, with a decrease in the government's observer reimbursement, the percentage of trips starting directly after midnight has increased to nearly 25 percent as vessels seek to minimize observer costs. Participants have expressed concerns that this may affect fishing safety. However, no change in incidents or accidents reported to the United States Coast Guard has been observed so far.

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#### NEW ENTRANTS AND GENERATIONAL TIES

Some participants perceive a lack of new entrants and young people in the groundfish fishery, and they lament the increased difficulty of progressing from the back deck to owning and running an independent fishing operation, as well as concern over a loss of knowledge in the trawl fishery as the average vessel operator ages out of the fishing workforce (3.2.3(b)). Successful new entrants often have family ties to the fishing industry, as quota, vessels, knowledge, or other resources often remain in the family (3.2.3(c)). Some aging quota share owners intend to keep their permits and lease out quota pounds as a way to secure a retirement income, as opposed to selling their quota shares. When they do sell shares, transactions usually involve large increments of quota and multiple species as an individual sells an entire portfolio, with most transactions involving amounts equivalent to more than 10,000 quota pounds. There appears to be little opportunity in the market for small quota acquisitions (3.2.3(b)). Difficulty in obtaining a loan was also among the factors participants believed contributed to the lack of new entrants.