

## WASHINGTON DEPARTMENT OF FISH AND WILDLIFE REPORT – ANALYSIS OF THE PROPOSED ADJUSTMENT TO THE SALMON TROLL LINCOD INCIDENTAL ALLOWANCE

### 1. Overview

This proposed management measure applies to the ocean salmon troll fishery and would be an adjustment to the existing incidental allowance for landing lingcod subject the number of Chinook landed. The alternatives under consideration are:

- No Action: one lingcod per 15 Chinook salmon.
- Alternative 1: one lingcod per 5 Chinook salmon.

Both alternatives apply only to trolling in the area north of 40° 10' N. latitude. This is the Council's first re-evaluation of the ratio since it was first implemented in 2009. There was interest expressed among the Council and the public in adjusting the limit through inseason action at the March 2018 meeting. However, it was determined that the original analysis did not support inseason or routine adjustment. This analysis assumes Alternative 1 would be intended for routine adjustment based on new information or circumstances, including adjustment back to the No Action ratio if conditions warranted.

Preliminary information on this management measure was included in the *Draft Appendix C – New Management Measures Detailed Analysis* document.<sup>1</sup> The information contained in this report is intended to replace the information included there. The main body of this report contains the information and data WDFW finds most relevant to the choice between No Action and Alternative 1. Responses to the standard questionnaire used Appendix C are provided in Section 5 at the end of the report.

#### *1.1. Features of the trip limit*

The ratio of lingcod per Chinook is the only part of the trip limit being considered for adjustment. However, there are other key features to the design of the No Action limit that would remain in place if Alternative 1 is preferred. These include a “plus one” lingcod, which provides flexibility to trollers who may catch lingcod before their full Chinook harvest is complete or who catch fewer Chinook than planned. Additionally, total catch on a trip is limited to a maximum of ten lingcod per trip, even if the number of Chinook were enough to allow more. Trollers are also subject to the lingcod open access monthly and minimum size limits.

The lingcod per Chinook ratio exists in large part because trollers are permitted to fish within the non-trawl Rockfish Conservation Area (RCA). Troll trips that never enter the RCA can retain lingcod subject only to the open access monthly limit.

The intended effect of the lingcod to Chinook ratio is to keep lingcod catch incidental to salmon trolling. Without the ratio, or by setting the ratio too liberally, the trip limit might create a targeted lingcod opportunity inside the RCA. The Council has not wished to create such an opportunity out of concern for rockfish bycatch as well as out of fairness to the groundfish sectors that are excluded from the RCA.

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<sup>1</sup> [https://www.pcouncil.org/wp-content/uploads/2018/05/E4\\_Att6\\_Appendix\\_C\\_New\\_Management\\_Measures\\_June2018BB.pdf](https://www.pcouncil.org/wp-content/uploads/2018/05/E4_Att6_Appendix_C_New_Management_Measures_June2018BB.pdf)

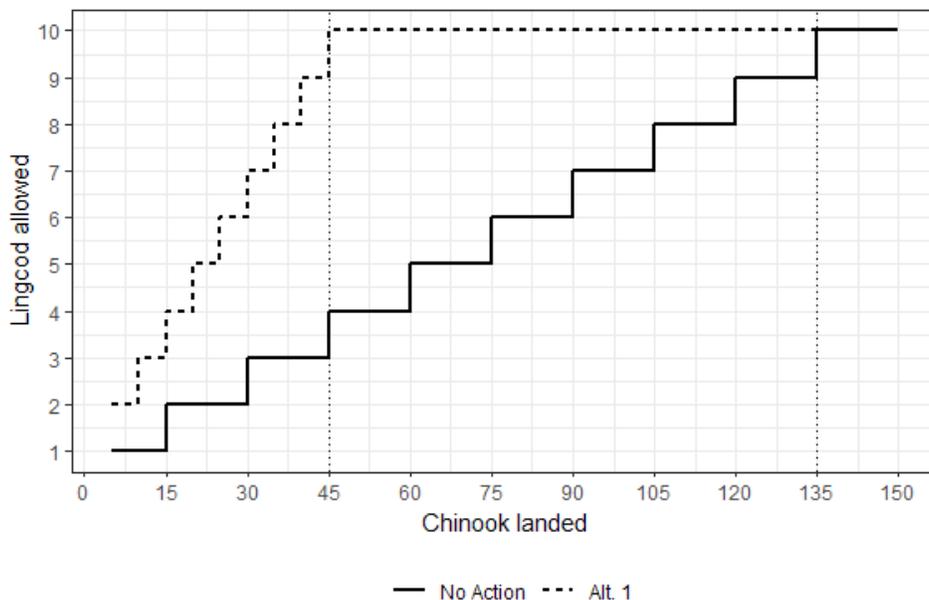
On the other side of the equation, without the ratio or with a ratio set too rigidly, trollers are required to discard truly incidental lingcod. Truly incidental lingcod would cause no impact to rockfish stocks than already caused by their pursuit of Chinook.

The ratio was and is seen as especially important to Washington trollers because the non-trawl RCA off Washington extends from shore to 100 fm, effectively covering all of the troll grounds. There are nearshore areas off Oregon and California not closed by the RCA where trollers may retain groundfish.

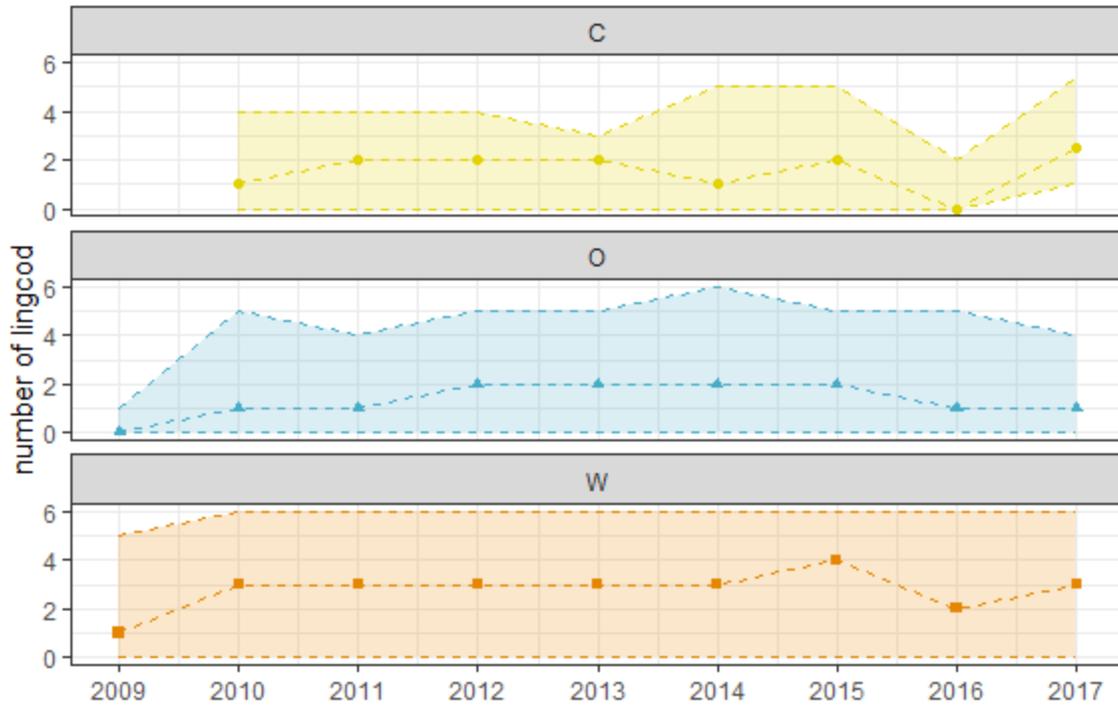
Another key factor involved with this lingcod trip limit are the vessel monitor system (VMS) rules in place to enforce the RCA and other closed areas used in groundfish management. All trollers must be equipped with a vessel monitoring system (VMS) if they wish to retain groundfish. The costs of VMS are known to have discouraged some portion of the troll fleet from taking advantage of the lingcod and other open access trip limits.

As a basic illustration of the difference between Alternative 1 and No Action, Figure 1 plots how the allowable lingcod per trip increases with the numbers of Chinook landed under each. As shown, Alternative 1 would allow trollers to retain the maximum 10 lingcod at 45 Chinook landed compared to 135 Chinook landed under the current ratio.

Figure 2 applies the same comparison of No Action and Alternative 1 but using the estimate number of Chinook landed on troll trips over 2009-2017. This “potential” maximum lingcod is a much different matter from the “actual” lingcod that would be expected, as seen below. However, as shown in Figure 2, Alternative 1 would typically allow one to three more lingcod per trip if Chinook landings fell with the range of what was seen over 2009-2017. On the upper end of the range, seen in the Washington panel, Alternative 1 would allow six more Chinook.



**Figure 1. Alternative 1 compared to No Action based on number of lingcod each would allow under the range of Chinook landings shown on the x-axis. The vertical dotted lines mark the number of Chinook at which the alternatives hit the 10 lingcod per trip maximum.**



**Figure 2. The number of extra lingcod Alternative 1 would have made available for landing if in place by state, 2009-2017. The middle, upper, and lower lines mark the median, 90th percentile, and 10th percentile lingcod per trip, respectively.**

### 1.2. General Policy Goals

The Council generally allows marketable species to be retained unless doing so conflicts with conservation, economic, or fair and equitable sharing goals. This approach is consistent with National Standard 7, National Standard 8 and other provisions of the MSA that guide the Council to achieve conservation in a manner that is cost effective and minimizes adverse impacts to fishing communities. Scientific and management uncertainty as to the effects of allowing retention are also reasons for not allowing species to be retained.

When the No Action ratio was last considered, rebuilding of yelloweye rockfish and canary rockfish were the main countervailing goals. In recommending the No Action ratio, the broad goal was to allow trollers the additional revenue from incidental catch without allowing opportunity or creating incentive for trollers to seek out lingcod. Lingcod is one of the more marketable of the groundfish FMP species.

The concern was that lingcod occupy the same habitats as canary and yelloweye. Increased catch of lingcod is presumed to be accompanied by increased bycatch of canary and yelloweye. Allowing for targeting also raises the potential for fair and equitable sharing concerns because lingcod targeting was and remains curtailed across several of the core commercial and recreational groundfish fisheries based on the same concerns about rockfish bycatch.

Ten years after recommending the No Action ratio, the same general concerns about lingcod targeting inside the RCA still apply. However, yelloweye bycatch now stands alone as the major reason why the

Council would require trollers to discard lingcod. Canary rockfish is rebuilt with a considerable surplus between its ACL and expected harvest. The same is true for lingcod north of 40° 10' N. latitude.

### *1.3. Proposed Evaluation Framework – Incidental versus Targeting*

As to yelloweye bycatch, Alternative 1 would be expected to differ from No Action only to the degree that it would influence fishing strategies and business decisions. As before, the claim made by the SAS and participants in the troll fishery is that lingcod are being caught incidentally. If so, trollers will fish the same way regardless of what the Council decides between No Action and Alternative 1. In turn, the amount of lingcod and yelloweye that are caught would be the same under either ratio. For lingcod, Alternative 1 would convert some portion of the incidental catch to landed catch, and to revenues, compared to No Action. Lingcod are thought to have a relatively high survival rate when discarded. All yelloweye are discarded under either alternative meaning no difference in fishing mortality. On the other hand, the extra lingcod revenue made possible by Alternative 1 could induce trollers to target or at least to fish in ways that make lingcod catches more likely. Techniques for targeting lingcod with troll gear are thought to be possible and some areas are known to contain more lingcod than others. In theory, the prospect of earning extra revenue may also influence fishing effort overall (i.e. making longer or taking more trips). Any of these changes in fishing behavior could raise the rate at which lingcod and yelloweye are encountered.

Looking to this spectrum of purely incidental to targeted catch is how this analysis proposes comparing and contrasting Alternative 1. This qualitative risk approach is recommended because it is not possible to quantify any difference in projected yelloweye catch with the data available. To provide the Council some means of qualitatively evaluating the potential for changed fishing behavior between Alternative 1 and No Action, the analysis provides a summary of troll lingcod activity and revenues over 2009-2017. The risk of targeting would be expected to be proportional to the economic incentive created by providing for the additional lingcod.

### *1.4. Connection to Yelloweye Rebuilding*

If the Council finds concern about the risk of increased yelloweye bycatch from Alternative 1, it may be viewed as an acceptable risk. The question of acceptable risk would be best evaluated within the framework of the rebuilding plan.

While yelloweye is still under a rebuilding plan, the Council is considering revising the plan at this meeting. The revisions under consideration would increase rebuilding annual catch limits (ACL). Scientific projections on rebuilding times are substantially changed from when the No Action limit was recommended. And, the Council also has several years of data on catch and the management uncertainty involved with yelloweye rebuilding measures across all fishery sectors.

Lingcod provide a source of revenue to trollers that would be relevant to both the needs of fishing communities evaluation the Council. Lingcod catches would also be of presumed relevance to the MSA's direction for rebuilding plans to "allocate both overfishing restrictions and recovery benefits fairly and equitably among sectors of the fishery." (MSA Section 304(e)(4)(B)).

### *1.5. Available Data for Evaluating Performance and Comparing Alternatives*

Trip limits are typically available for routine adjustment. They are imprecise tools and so adjustments based on new information and circumstances are often necessary to achieve their policy goals.

Many trip limits, like the one provided to trollers for Pacific halibut, are designed to control landed catch. Their performance can thus be directly tracked using fish ticket receipts on landings. This lingcod per Chinook ratio is different in that its broad goal is to maintain the ratio at the incidental rate or at least as a precautionary measure to prevent targeting. Either way, directly evaluating how well the No Action ratio has worked or would compare to Alternative 1 would require information on catches and discards, not just landings. The troll fleet does not have such data. Landings data can be used but leaves much in question. For instance, it is not possible to differentiate which Oregon trips fished within the RCA versus those that may have taken places in open areas where the ratio did not apply. In addition, when no lingcod appear on a fish ticket it could be because the troller was not interested in retaining the fish or because no fish were encountered. These challenges and their effect on interpretations are noted throughout where relevant.

### *1.6. New Information and Circumstances*

With perfect information, the Council would adjust the lingcod to Chinook ratio based on changes in the abundance of the two species. Even with observer data on discards, this would be challenging to track and predict.

Lingcod and Chinook have both seen substantial changes in abundance since 2009. For lingcod, the biomass of age 3 and older fish north of 40° 10' N. latitude is estimated to have grown to 34,064 mt in 2017, up from 23,078 mt in 2009.<sup>2</sup> While these exact numbers are uncertain, the science more confidently shows the increasing trend that trollers have testified as observing out on the water.

Chinook, in contrast, have experienced ups and downs since the No Action ratio was recommended in 2008. With a relatively quick life cycle and the strong influence that ocean and freshwater conditions can have on populations, this variability will be expected. Chinook variability is not just year to year but is also seen between the populations and areas.

There can be a lot of randomness in fisheries catches and so the presumed relationship between catch and abundance may not hold.

## **2. Lingcod activity, 2009-2017**

This section focuses on the activity of the troll vessels during 2009-2017 focusing on basic effort patterns in overall troll activity and troll lingcod landings. In addition to summarizing how lingcod activity as looked under No Action, the information also provides an indirect look at the relative strength of the economic incentive lingcod revenues have offered salmon trollers.

Unlike many of the groundfish trip limits, which limit landings on cumulative monthly or bimonthly basis, Alternative 1 and No Action are true trip limits and so are best evaluated at the trip level. To assemble trip level data, this analysis follows the vessel-day convention where all tickets from the same vessel are assumed to have come from the same fishing trip. Where vessels have same-day fish tickets from more than one state, the trip is assigned to a single state based on where the majority of the troll salmon revenues were delivered.

Of note, the analysis of landings in terms of numbers of fish must be recognized as approximate. Lingcod are not reported in numbers of fish on fish tickets except in Washington. And in Washington, while

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<sup>2</sup> See Table 8 of ([http://www.pcouncil.org/wp-content/uploads/2017/08/E8\\_Att1\\_Lingcod\\_FullDoc\\_E-Only\\_SEPT2017BB.pdf](http://www.pcouncil.org/wp-content/uploads/2017/08/E8_Att1_Lingcod_FullDoc_E-Only_SEPT2017BB.pdf))

compliance with this requirement has steadily improved since 2009, it is still less than 100 percent. Therefore, assumptions about average weights are necessary to convert landing weights to numbers. This is not an uncommon situation in fisheries management. Salmon fisheries and groundfish recreational fisheries require applying average weights to convert from numbers to weights and vice versa. In addition, the number of Chinook are also only reported directly on fish tickets in Washington. Monthly average weights from the PFMC Blue Book were used estimate numbers of Chinook for Oregon. More details on methods are available from WDFW.

### *2.1. Salmon Troll Activity*

Looking to the data since 2009-2017, there are two prominent patterns of note to this analysis. First, the amount of overall fishing effort can vary substantially, especially in Oregon. The number of troll trips making landings of Chinook ranged from under 500 to over 5,500 (Figure 3). The other pattern of note is that only a relatively small proportion of the troll fleet has landed lingcod each year, as discussed below. This suggests that the amount of lingcod, and in turn yelloweye, that are caught each year will be highly variable and depend mostly on the strength of the salmon seasons. This also suggests that the economic benefit provided by lingcod has been attractive only to a relatively small proportion of the troll fleet and that we are only seeing a fraction of the lingcod caught being landed. The suspected reason for the low participation rate would be the costs of VMS, although other factors could be at play. It could be that some trollers do not encounter lingcod in their areas or lack markets.

In California, only 3 vessels have landed troll lingcod— on 3 total trips—from areas north of 40° 10' N. latitude. While most salmon trolling in California takes place south of 40° 10' N. latitude, there were 220 different salmon troll vessels operating in that area over 2009-2017. And in some years, that area has seen as many trips as Washington. The VMS derived map reproduced in Figure 4 from Watson et al. (2017) provides support for the theory that VMS may be a key reason why more lingcod are not landed.<sup>3</sup> Because of this low level of activity, California is not included in further analysis of 2009-2017 activity.

Washington and Oregon have seen more troll lingcod activity than California. At the same time, participation rates have been relatively low. Figure 5 shows the time series of the total number of vessels landing Chinook (middle panel) and the number (top panel) and percentage (bottom panel) of vessels landing lingcod.

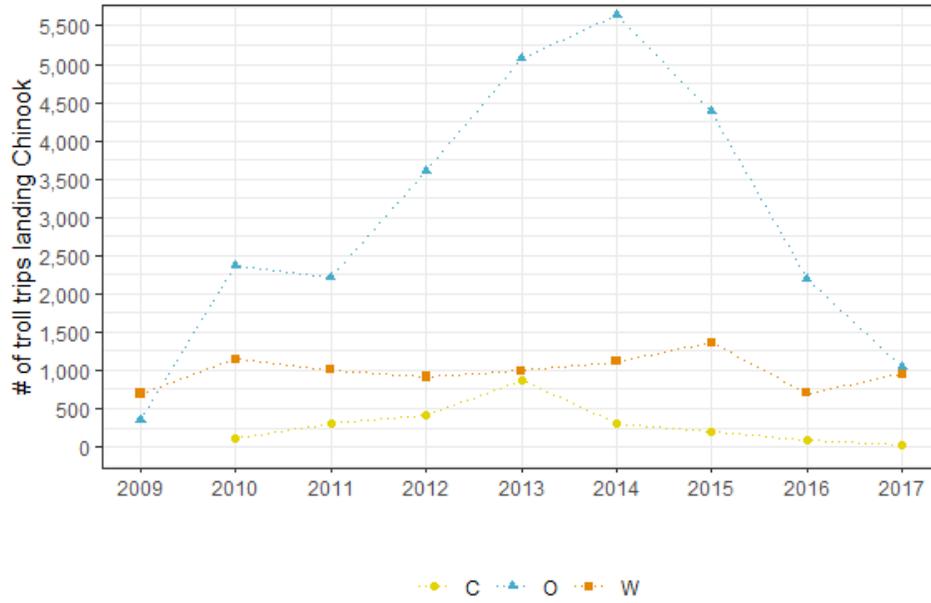
As shown, participation by Oregon vessels ramped up between 2009 and 2011 with 2017 reaching the highest level in the time series at just over 20 percent (Figure 5, bottom panel). Part of that ramp-up is due to the low salmon year Oregon had in 2009. With that year excluded, the average participation percentage is 14.7 percent. Oregon saw large swings in the number of vessels participating, ranging from 7 to 85 trollers landing lingcod per year (Figure 5, top panel).

Participation in Washington has been relatively steady, ranging between 10 and 17 boats per year. In percentage terms, Washington has seen 12.3 percent of salmon troll vessels land lingcod on average over 2009-2017. Participation may appear to be slightly increasing in Oregon, although if the low year of 2009 is excluded then the overall trend is not statistically differentiable from the 2009-2017 average. The same lack of statistical trend is true for Washington vessels considering either the 2009-2017 or 2010-2017 time periods.<sup>4</sup>

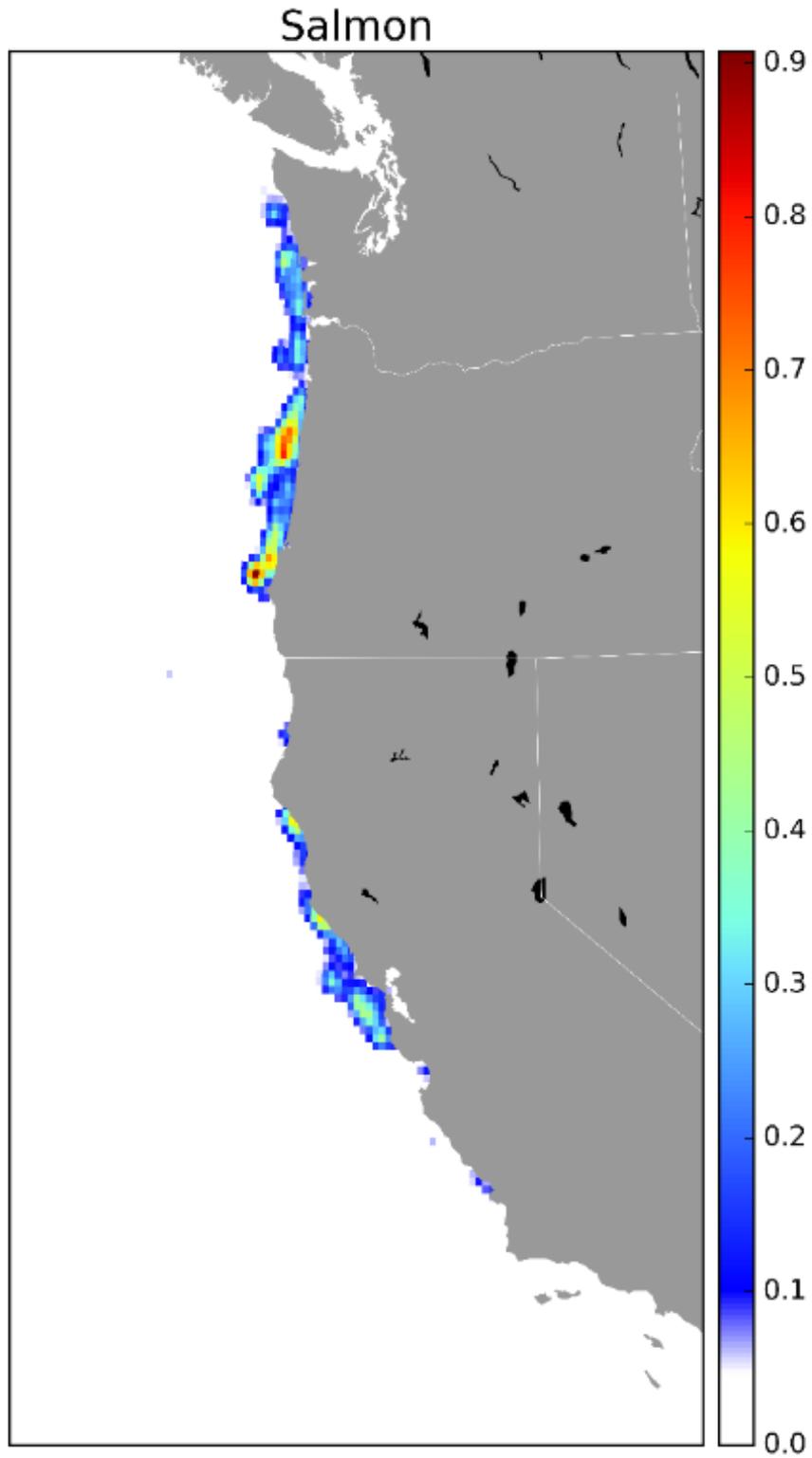
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<sup>3</sup> Watson, James R., Emma C. Fuller, Frederic S. Castruccio, and Jameal F. Samhoury. "Fishermen Follow Fine-Scale Physical Ocean Features for Finance." *Frontiers in Marine Science* 5(2018): 46. <https://www.frontiersin.org/articles/10.3389/fmars.2018.00046/full>.

<sup>4</sup> These statements are based on simple linear regressions using year as the sole explanatory variable.



**Figure 3. Number of troll landings of Chinook by state.**



**Figure 4.** Fishing intensity (log10 fishing days) for salmon troll vessels calculated from the VMS data over the period 2009–2013 (see text for citation to source).

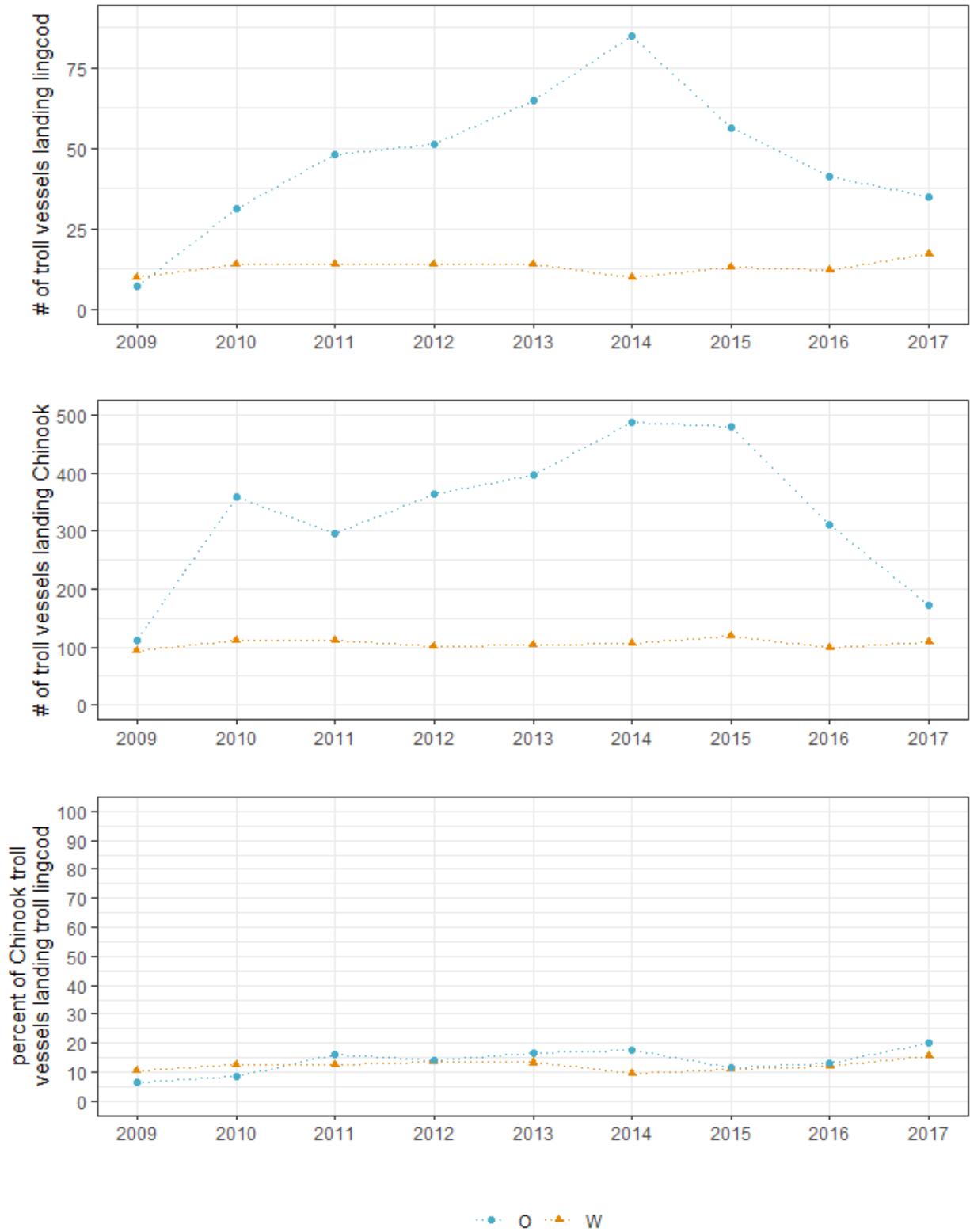


Figure 5. Number of troll vessels landing lingcod (top panel), Chinook (middle), and the percentage landing both troll lingcod and Chinook (bottom panel).

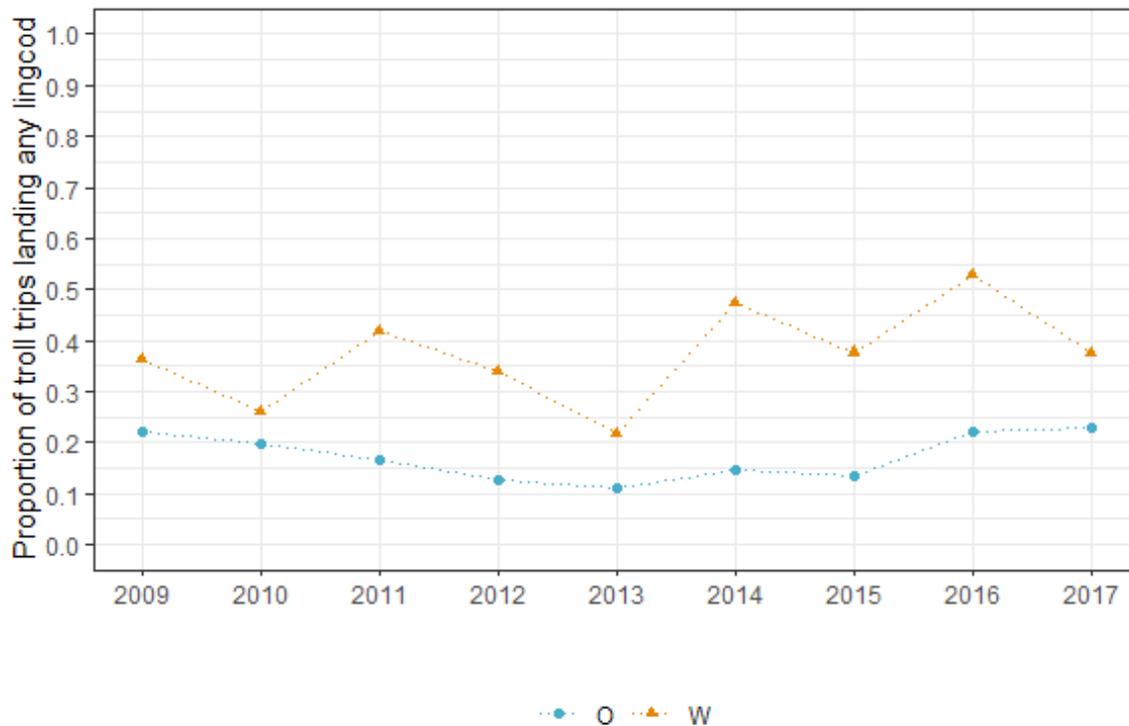
## 2.2. Lingcod landing trollers

This section further explores the activities of the subset of trollers that landed lingcod.

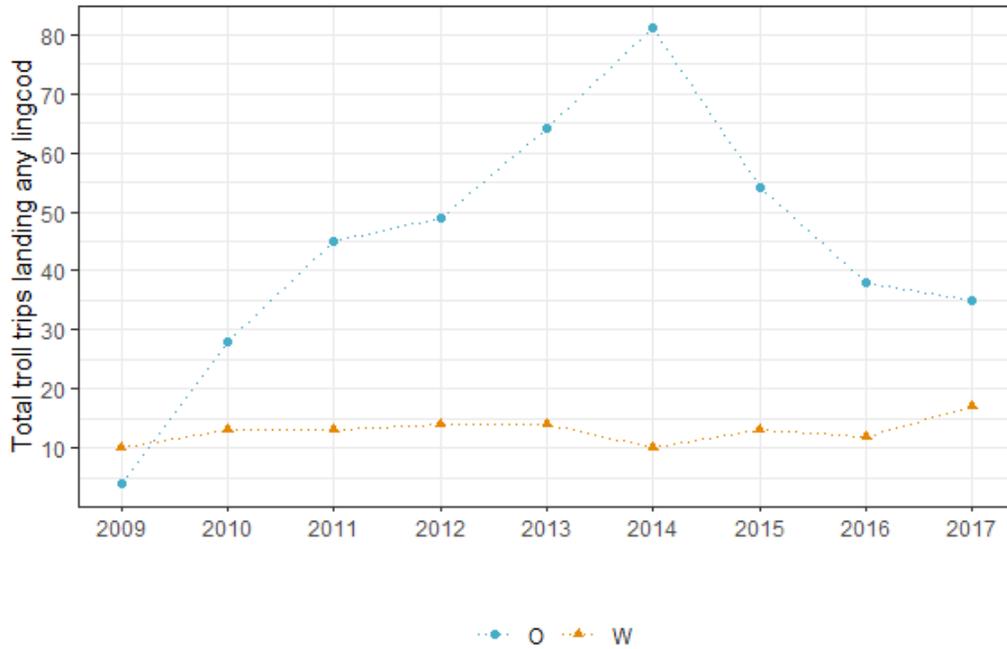
Figure 6 plots the proportion of troll landings that included lingcod for all vessels that landed any amount of troll lingcod in a season. In Washington, fewer than half of landings have included lingcod, except in 2016, and in some years it has only been around a quarter of landings. Oregon data shows that less than a quarter of trips brought in lingcod every year. If trollers are targeting lingcod, these numbers suggest that the average vessel only does so, or is only successful at doing so, on some trips.

Figure 7 shows the total number of trips landing lingcod. In 2014, the most active troll year in the time series, roughly 90 trips brought in lingcod between Oregon and Washington.

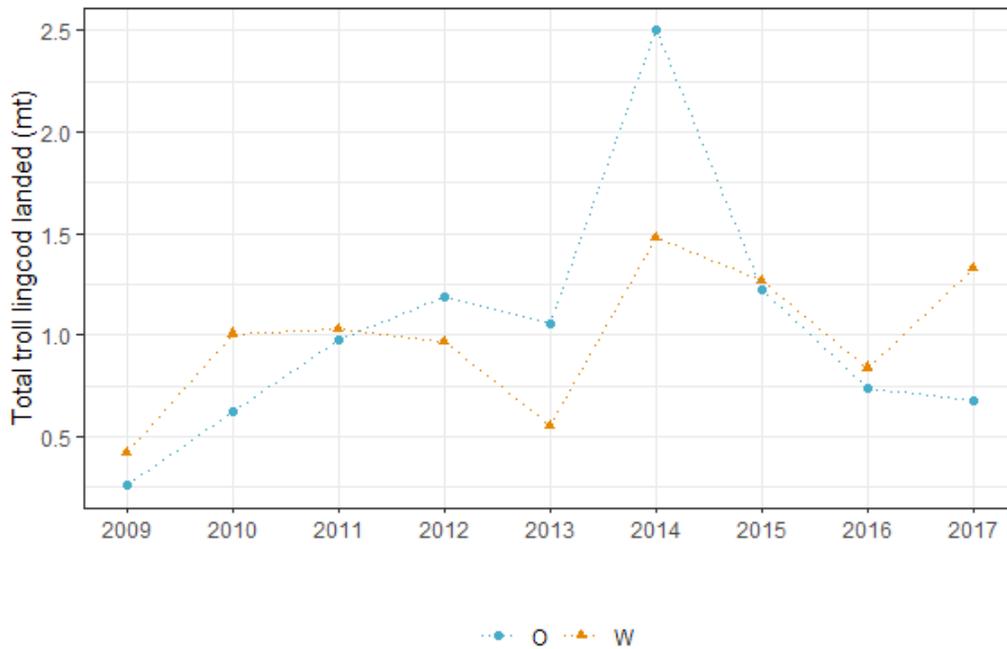
Figure 8 then shows the magnitude of lingcod landings by each state. Figure 9 next plots the two states' landings combined. In the active 2014 year, both states landed about 4 mt of lingcod. The combined state average over 2009-2017 was just over 2 mt. These numbers amount to a small proportion of total lingcod landings. And total harvest across all sectors has been and is expected to continue to be considerably below the ACL for the northern stock.



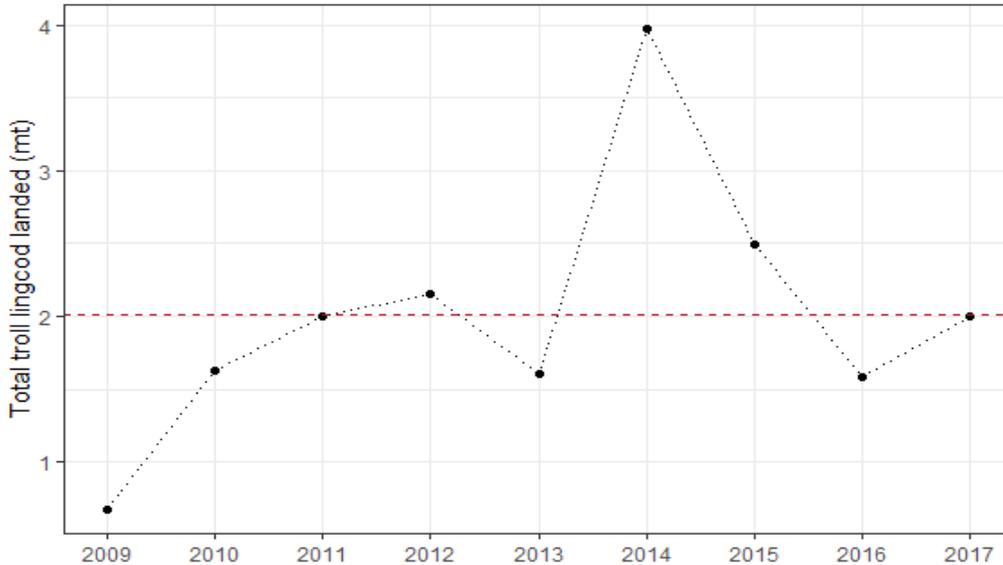
**Figure 6. Troll trips landing lingcod as a proportion of all Chinook trips by the subset of trollers who landed any lingcod during the season.**



**Figure 7. Troll trips landing lingcod as a proportion of all Chinook trips by the subset of trollers who landed any lingcod during the season.**



**Figure 8. Total weight of troll lingcod landings by state.**



**Figure 9. Total weight of troll lingcod landings by state with the horizontal dashed line representing the 2009-2017 average.**

### *2.3. Variation among vessels*

The data shown above was aggregated across all troll landings by state and year. The figures shown here are intended to explore variation among vessels. Lingcod appear to be more important to some vessels than others.

Figure 10 and 11 show the median, 75th, and 90th percentile values for the proportion of positive and number of lingcod landings per year, respectively. The data are combined across Oregon and Washington because vessels were classified to state only on a trip level basis.

As shown in 10, the median vessel proportion positive has bounced between 0.10 and 0.40 since 2009. There is some spread in the experience across vessels. The 90th percentile (i.e. the level marking the the top 10 percent of vessels) has been above 0.5 in multiple years and over 0.85 in 2016. Yet even some years the vessels in the top 10 percent landed lingcod on fewer than half of their trips.

Looking to the counts of landings in Figure 11, this shows that the median number of landings has only been between one and two landings per year. And the high proportion seen at the 2016 90th percentile translates to only 5 landings of lingcod overall.

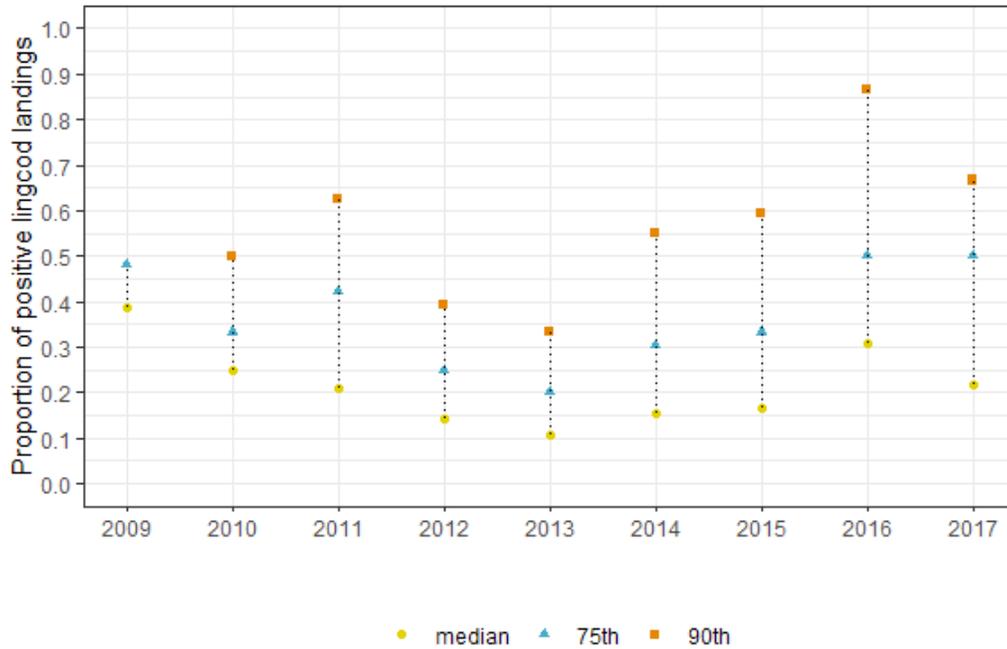


Figure 10. Vessel level variation—median and 75th and 90th percentiles for proportion of the season’s troll landings that included lingcod. The 90th percentile is excluded from 2009 because of too few vessels.

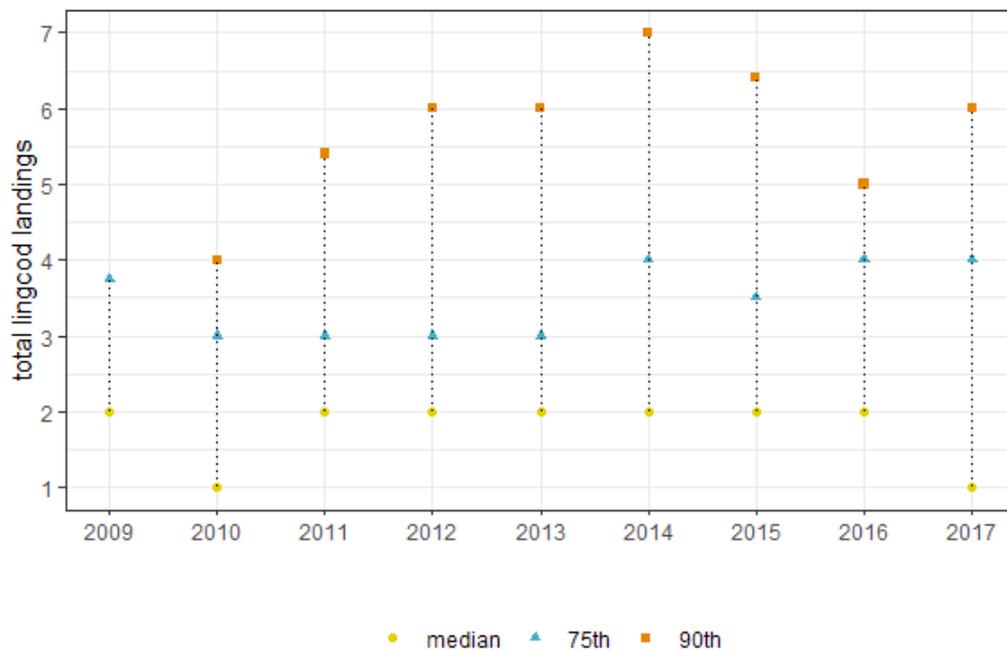


Figure 11. Vessel level variation—median and 75th and 90th percentiles for number of troll lingcod landings per season. The 90th percentile is excluded from 2009 because of too few vessels.

#### 2.4. *Focusing on No Action*

One measure of the effects of the No Action ratio and the need or benefits of adjusting it is the frequency with which trips have bumped up against the maximum number of lingcod allowed on a trip. A large proportion of trips hitting the maximum might indicate that lingcod are being targeted, although this could also happen if the incidental rate is high.

Again, because of the limitations in the landings data as to numbers of fish, this evaluation can only be approximate and depends on assuming an average weight. In addition, as previously noted with Oregon vessels, it is not possible to differentiate which trips were subject to the ratio because of fishing within the RCA from those that never entered the RCA and may retain any number of lingcod up to the monthly limit.

In recognition of the uncertainty and variability in the average weight of lingcod, the analysis shown here uses two average weight scenarios: (1) a 7 lb average based on Oregon fixed gear commercial landings; and, (2) a 16 lb average based on Washington fish tickets where lingcod were reported in both numbers of weight.

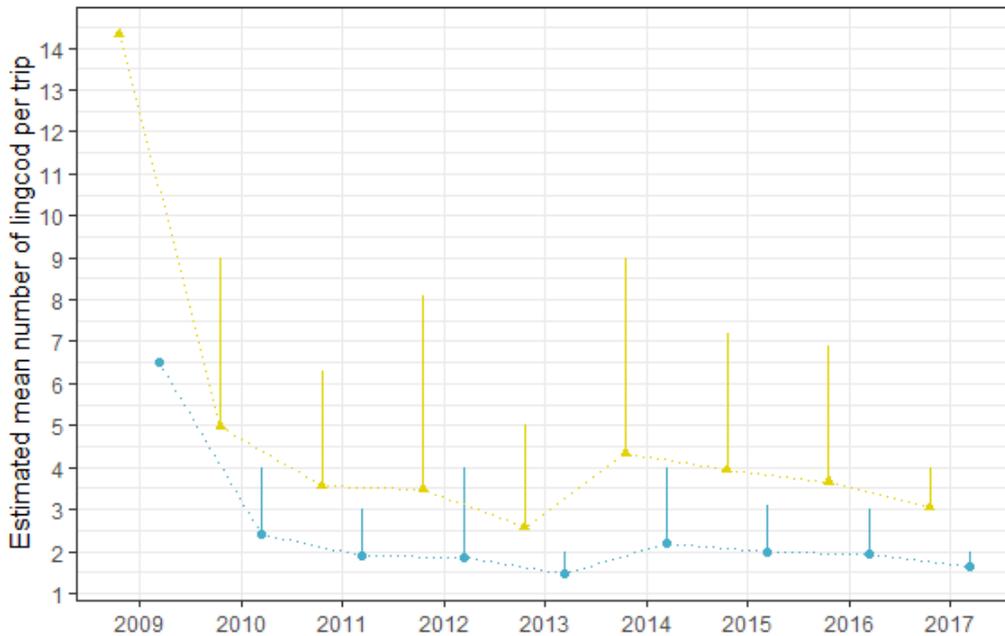
With either the No Action or Alternative 1 ratio, the max number of lingcod allowed depends on the number of Chinook brought in. The average estimated number of lingcod brought in by trip and year are shown in Figure 12 for Oregon and Figure 13 for Washington under both average weight assumptions. The figures plot both the average and 90th percentile values. This look lends support to the fish ticket data suggesting that the 16 lb. average weight may be more appropriate for Washington—the height of the 90th percentile range shows a large portion of the landings coming in over 10 lingcod under the 7 lb. assumption 13 in most years.

The proportion of trips estimated to have reached their max are shown in Figure 14 for Oregon and Figure 15 for Washington. The values are relatively high in both states. So of the landings that brought in any lingcod at all, they are estimated to have reached the ratio limit more often than not in most years. Oregon has seen between 50 and 90 percent of the landings hitting the max ratio. Washington shows a similar range of values although there are larger differences seen between the two average weight scenarios. Using the 16 lb. average weight, it's been between 30 and roughly 75 percent of trips reaching the max ratio. At the 7 lb. average weight, the percentage varies between roughly 75 percent and 95 percent.

Some may view the maximum ten lingcod per trip as a target, or at least an indication that the Council was comfortable with landings of that magnitude. Landings of 10 lingcod or greater have been relatively infrequent. Assuming the 16 lb. lingcod average weight, there have only been 23 such landings. With the smaller 7 lb. average weight, the estimate increases to 139. Across Oregon and Washington, there have been a total of 1,395 troll landings that included some number of lingcod over 2009-2017.

The distribution of estimated numbers of lingcod for landings estimated to have maxed out on the Chinook ratio are shown in Figure 16 as a cumulative distribution plot using both average weight assumptions. The numbers displayed on the y-axis can be used to gauge the percentage of landings falling below or above any value or between two values on the x-axis. For an example using the Oregon panel, the ten lingcod estimate on the x-axis under both average weight assumptions fall near 0.9 on the y-axis. This means that roughly 10 percent of the landings estimated to have reached the maximum lingcod allowed based on the No Action ratio brought in 10 or more lingcod (i.e.  $1 - 0.9 = .1$ , or ten percent) and that 90 percent have maxed out at a smaller number. The Washington data shows a lower percentage hitting 10 under the 16 lb. average weight and a greater percentage than Oregon at the 7 lb. average weight.

Lastly for this section, Figure 17 displays similar information using just Washington fish ticket data where the number of lingcod were reported on the fish ticket. The numbers in the figure are counts of the number of trips by the maximum number of lingcod that could have been landed under No Action by the actual number of lingcod reported. For example, looking to 2 on the x-axis (indicating that two lingcod could be kept under No Action) there were 20 trips where 2 lingcod were reported, 18 where only 1 lingcod was reported, and fewer than 3 where 3 lingcod were recorded.



**Figure 12. Oregon—estimated mean number of lingcod per trip using average weights of 7 lbs. (yellow, triangle symbol) and 16 lbs. (blue, dot symbol) extending to 90th percentile value as indicated by colored vertical lines (the 90th percentile for 2009 is excluded because of low level of activity).**

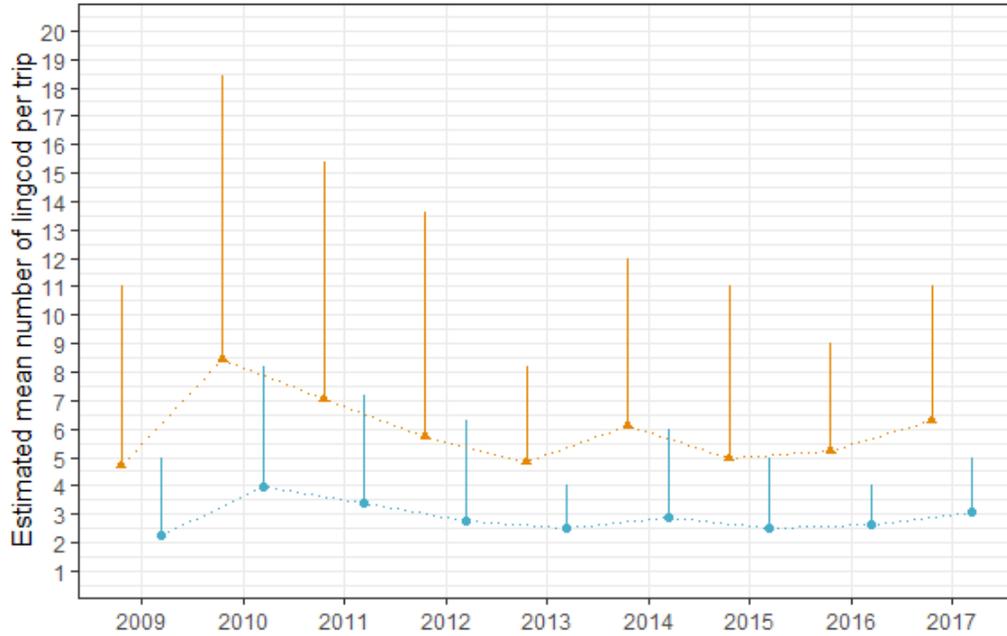


Figure 13. Washington—estimated mean number of lingcod per trip using average weights of 7 lbs. (orange, triangle symbol) and 16 lbs. (blue, dot symbol) extending to 90th percentile value as indicated by colored vertical lines.

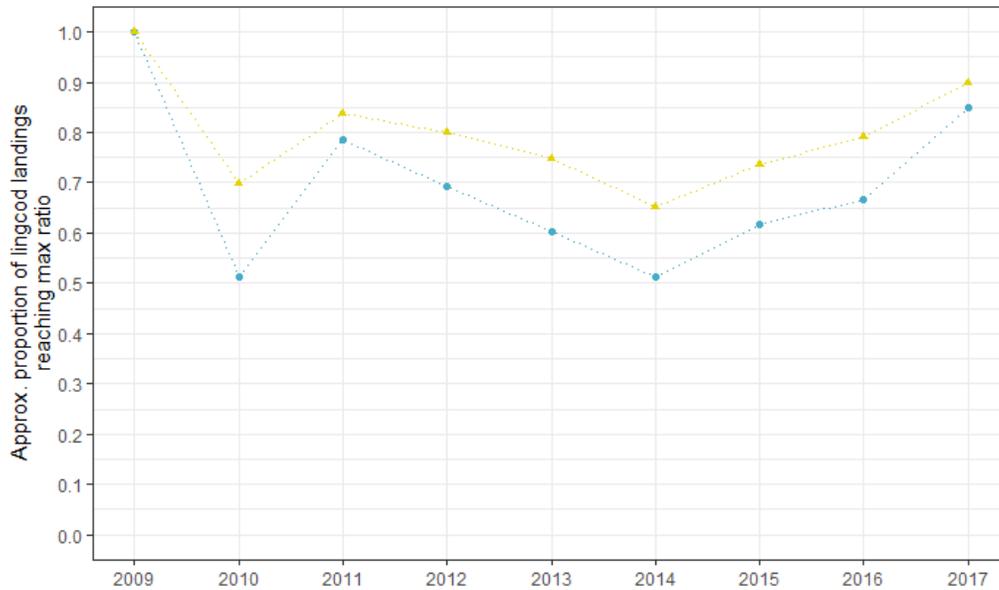


Figure 14. Oregon—estimated proportion of trips hitting max number of lingcod allowed by No Action ratio using average weights of 7 lbs. (yellow triangle symbol) and 16 lbs. (blue dot symbol).

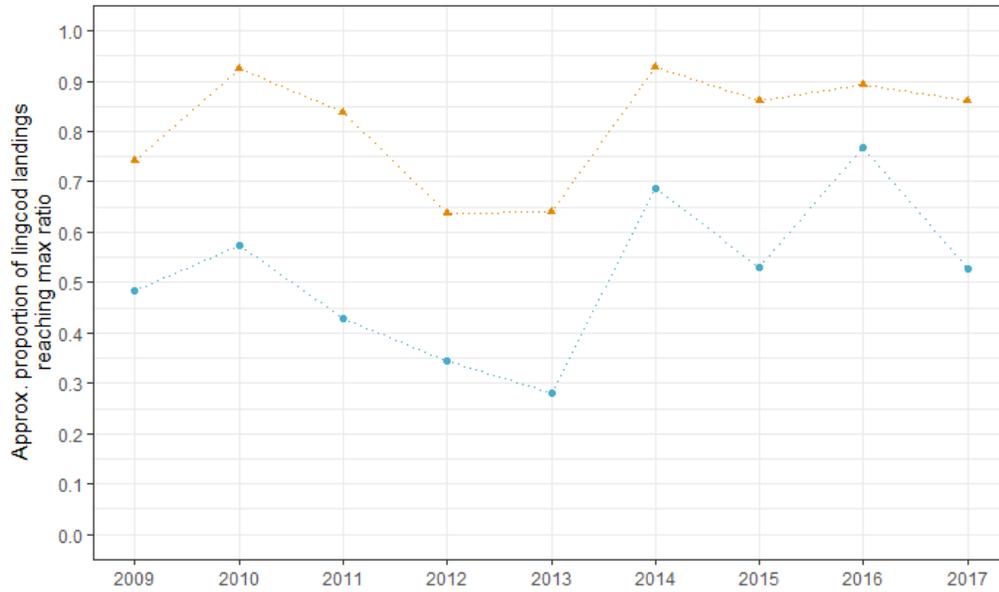


Figure 15. Washington—estimated proportion of trips hitting max number of lingcod allowed by No Action ratio using average weights of 7 lbs. (orange triangle symbol) and 16 lbs. (blue dot symbol).

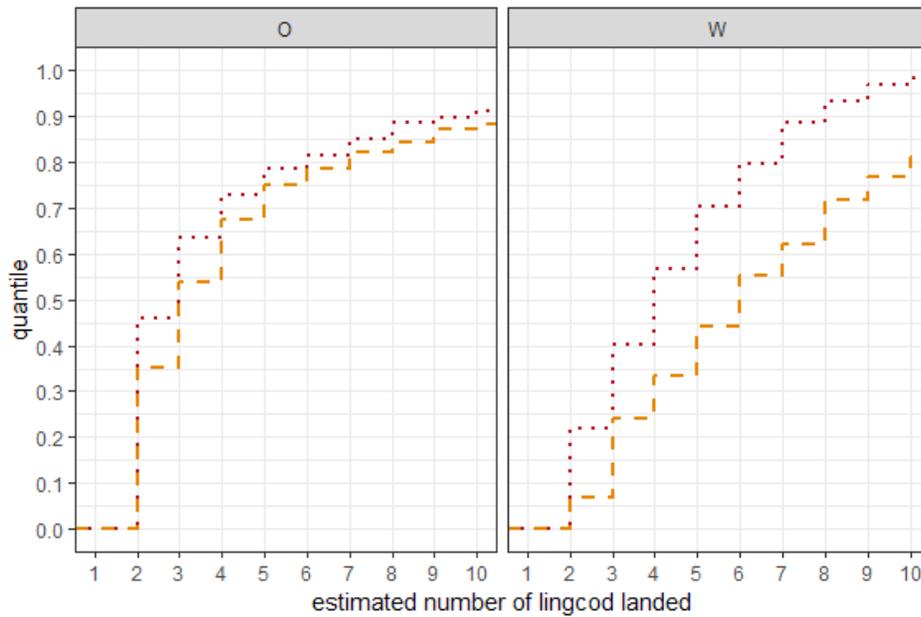
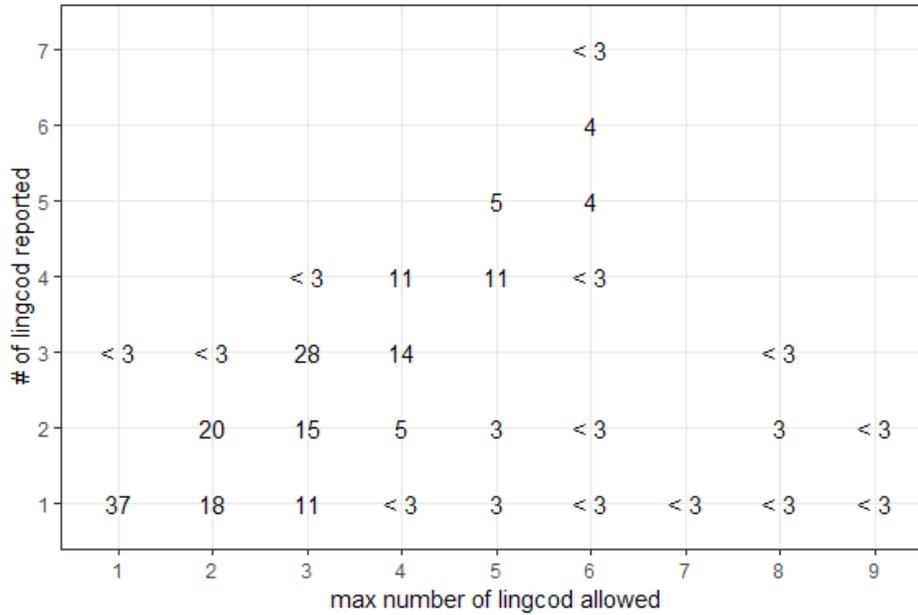


Figure 16. Cumulative frequency distribution of troll landings reaching the maximum number of lingcod allowed by the No Action ratio assuming a 16 lb. average weight (red, dashed lines) and 7 lb. average weight (orange, dotted lines). The x-axis is clipped at the 10 fish maximum.



**Figure 17. Tabulation of trips by number of lingcod reported and maximum number of lingcod allowed. The data is limited in this figure to Washington fish tickets where number of lingcod were reported, 2011-2017. Non-zero entries that are masked for confidentiality reasons are marked as “< 3”. True zeros are blank.**

### 2.5. Comparison to tribal troll

The treaty tribes of Washington also have salmon troll fisheries where lingcod is retained. Their lingcod retention is subject to trip limits but is not tied to a ratio of Chinook. In addition, the trip limits are also set for groundfish targeted trips and so are set higher than what a troller would be expected to encounter. Although there are many factors at play, such as differences in areas of fishing, tribal landings may be used as a point of comparison as a fishery that is less constrained with lingcod than the non-tribal fishery. The tribal data available in PacFIN does not include vessel identifiers. So each fish ticket was assumed to equate to a trip.

Figure 18 compares the average rate of positive lingcod landings between tribal trollers and the subset of Washington and Oregon trollers retaining lingcod within a season. As shown in the upper panel of that Figure, the tribal landings show a similar rate of positive lingcod landings as Oregon trollers with Washington trollers showing a substantially higher rate in some years.

The middle panel of Figure 18 compares the tribal and non-tribal landings using the average weight of a lingcod landing using just the positive (i.e. non-zero) landings. On this measure, the Washington and tribal trollers overlap in most years with the Oregon trollers showing a lower average weight.

The Washington and tribal landings also look similar when measures as the ratio of lingcod to Chinook by weight (Figure 18, bottom panel). Weight is used as it is reported across all fish tickets and removes the uncertainty from needing to estimate the number of lingcod and Chinook landed in Oregon.

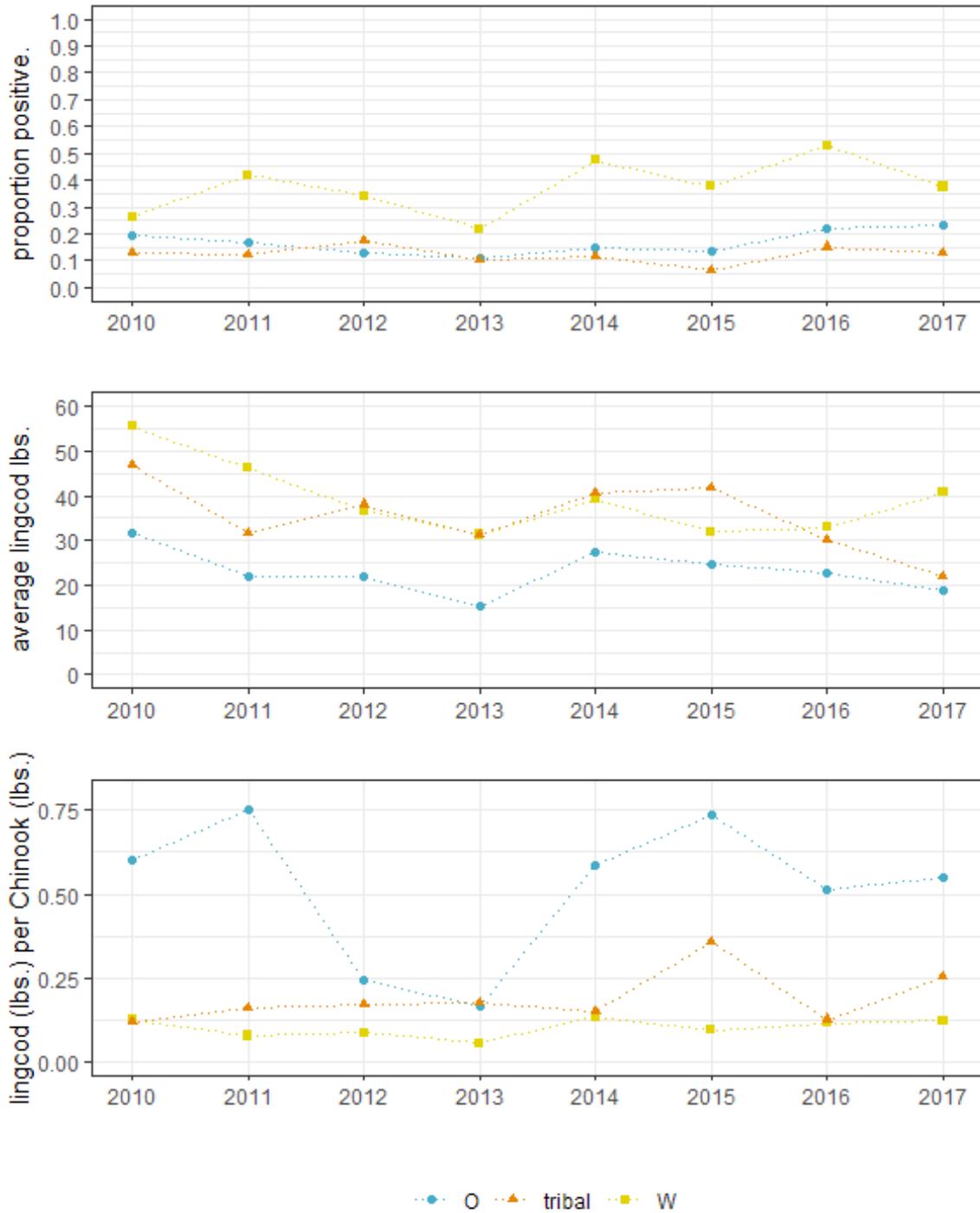


Figure 18. Comparing tribal and non-tribal troll lingcod landings using proportion of trips that included lingcod (top), average lbs. of lingcod landed (middle), and the ratio of lingcod lbs. to Chinook lbs. (bottom).

## 2.6. *Monthly harvests*

As noted, lingcod caught under the No Action and Alternative 1 trip limits count against the open access lingcod monthly limit. This ultimately limits the total lingcod harvest that trollers can make, however, the monthly limit has not really factored in over 2009-2017. The level of Chinook harvest opportunity and encounter rate with lingcod have kept the average monthly harvest to lower levels. At the same time, trollers may also fish in the open access fishery using other gears and troll caught lingcod factors into the broader portfolio for some participants.

The current open access limit for the area north of 40° 10' N. latitude is 300 lbs. per month for January-April and December and 700 lbs. per month for May through November. The monthly limit is scheduled to change to 900 lbs. per month north of 42° N. latitude and 600 lbs. between 40° 10' N. latitude and 42° N. latitude and 40° 10' N. latitude for all months in 2009. These limits are subject to in season adjustment. The current limits and scheduled increases are larger than what was available for the bulk of the 2009-2013 timeframe, which was predominately 400 lbs. per month in the months when trolling was active. The historical limits are displayed below in Figures 19 and 20 with gray dashed lines.

Those two figures plot the total lingcod landings of vessels landing troll Chinook combined with lingcod landed using troll plus all other open access groundfish gears. They display the average by month and the average of the top three vessels. Only vessels that made and months where landings of troll Chinook occurred are included.

As seen in Figure 19, Washington vessels have not approached the monthly limits, either using troll or in combination with other open access gears. Across most months, the difference between the average lingcod harvest troll and all open access gears is not detectable in the graph. This likely reflects the lack of commercial nearshore grounds off the state.

The typical trollers in Oregon, as measured by the monthly average landings, also have not approached the monthly limits (Figure 20). However, the average of the top three shown in that same figure does reach the limits in several months during 2009-2017 looking at landings from all open access gears.

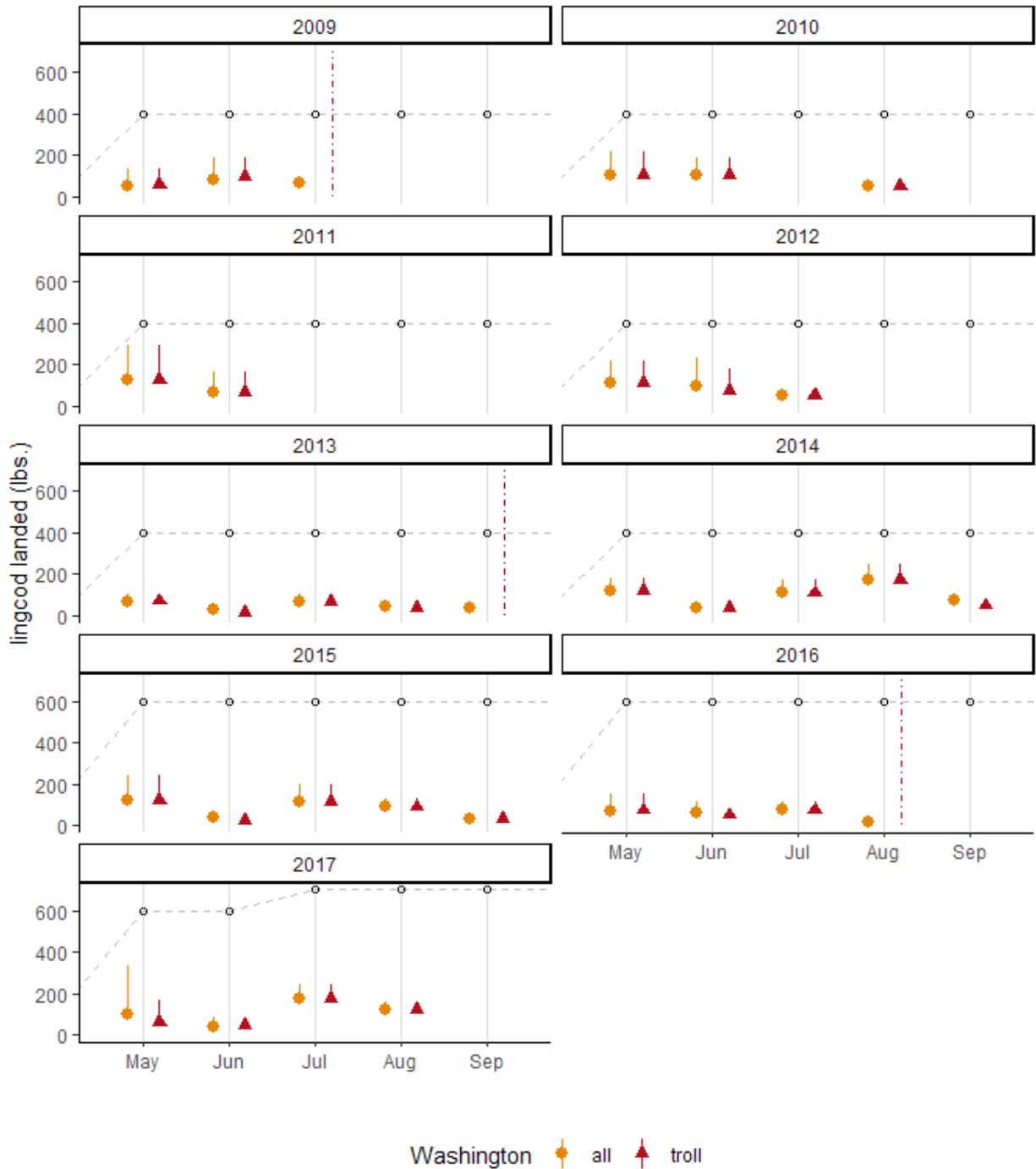
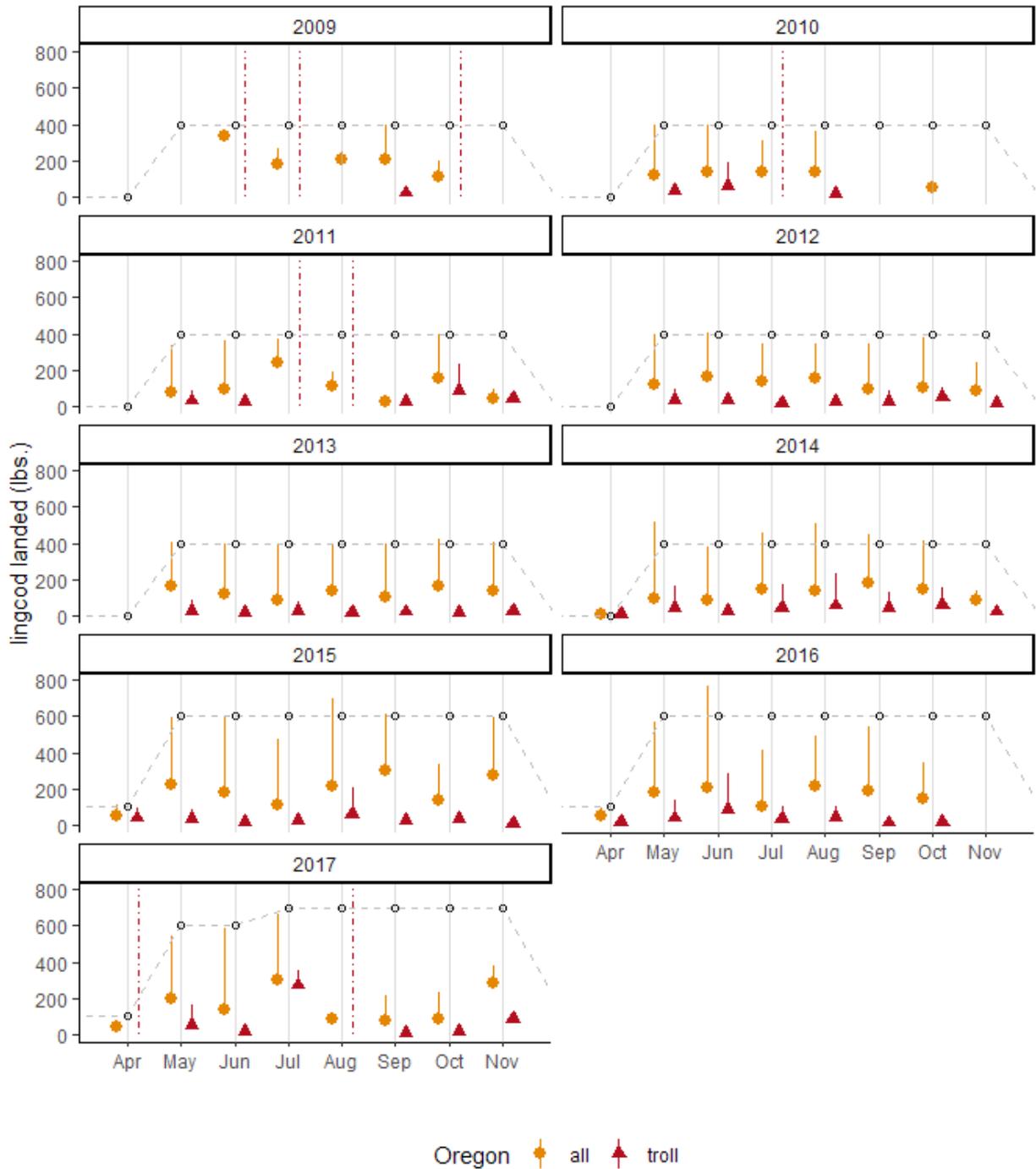


Figure 19. Washington—Average monthly lingcod landings by vessels from troll gear only (filled circles) and troll gear plus all open access gears (triangles). The tips of the vertical lines extending from the averages show the average for the top three vessels. A vertical line displayed as dotted indicates the data for that month is confidential. Monthly open access lingcod limits are shown with the open points at the center of each month and connected by the dashed line.



**Figure 20. Oregon—Average monthly lingcod landings by vessels from troll gear only (filled circles) and troll gear plus all open access gears (triangles). The tips of the vertical lines extending from the averages show the average of the top three vessels. A vertical line displayed as dotdash indicates the data for that month is confidential. Monthly open access lingcod limits are shown with the open points at the center of each month and connected by the dashed line.**

### 3. Revenues

This section focus on the revenues trollers have earned from lingcod landings. This information may be of interest to the Council's considerations of the rebuilding plan. The information is also relevant to the matter of the relative strength of the economic incentive lingcod has offered to trollers.

Lingcod revenues by region are shown for the area north of 40° 10' N. latitude as a whole (Figure 21), by state (Figure 23), and by port (Figure 24). Landings were grouped into regions based on data confidentiality considerations and out of recognition that Cape Falcon is a key management line for the salmon troll fishery. California is excluded from Figures 23 and 24 for confidentiality reasons although all three landings were made into Eureka area ports.

The time series of average price per lb. received for troll caught lingcod in Washington and California is displayed in Figure 22. The trend in prices appears to have been flat.

All in all, lingcod's economic role appears minor from the perspective of the fishery as a whole. The revenues earned from Chinook and coho were between 500 and nearly 2,000 times larger than those from lingcod (Figure 25). This supports the idea that lingcod only have a minor effect on overall fishing effort in the troll fleet. Nonetheless, lingcod's importance could differ by individual. The portfolio of revenues on a vessel basis is considered below.

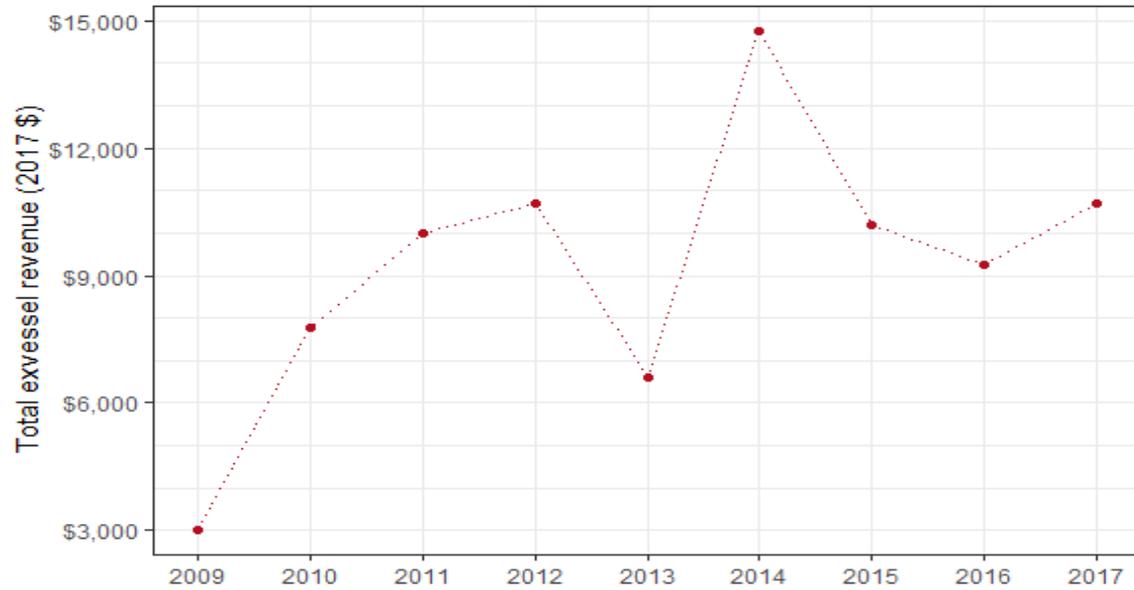


Figure 21. Total annual exvessel revenues (2017 \$) from lingcod caught with troll gear.

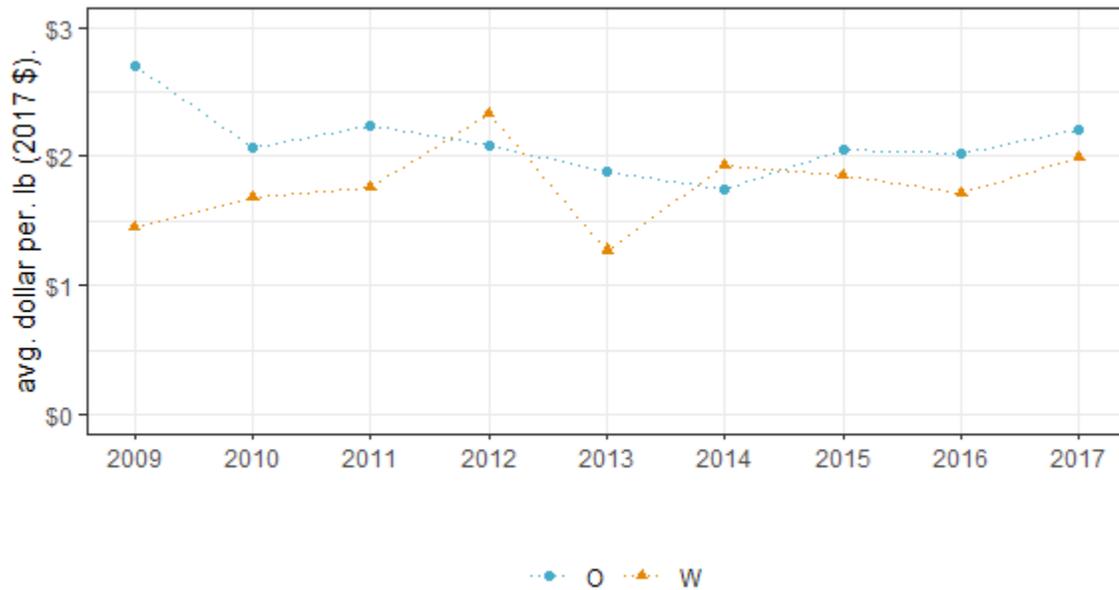


Figure 22. Average troll caught lingcod price per lb. using 2017 constant dollars, by state.

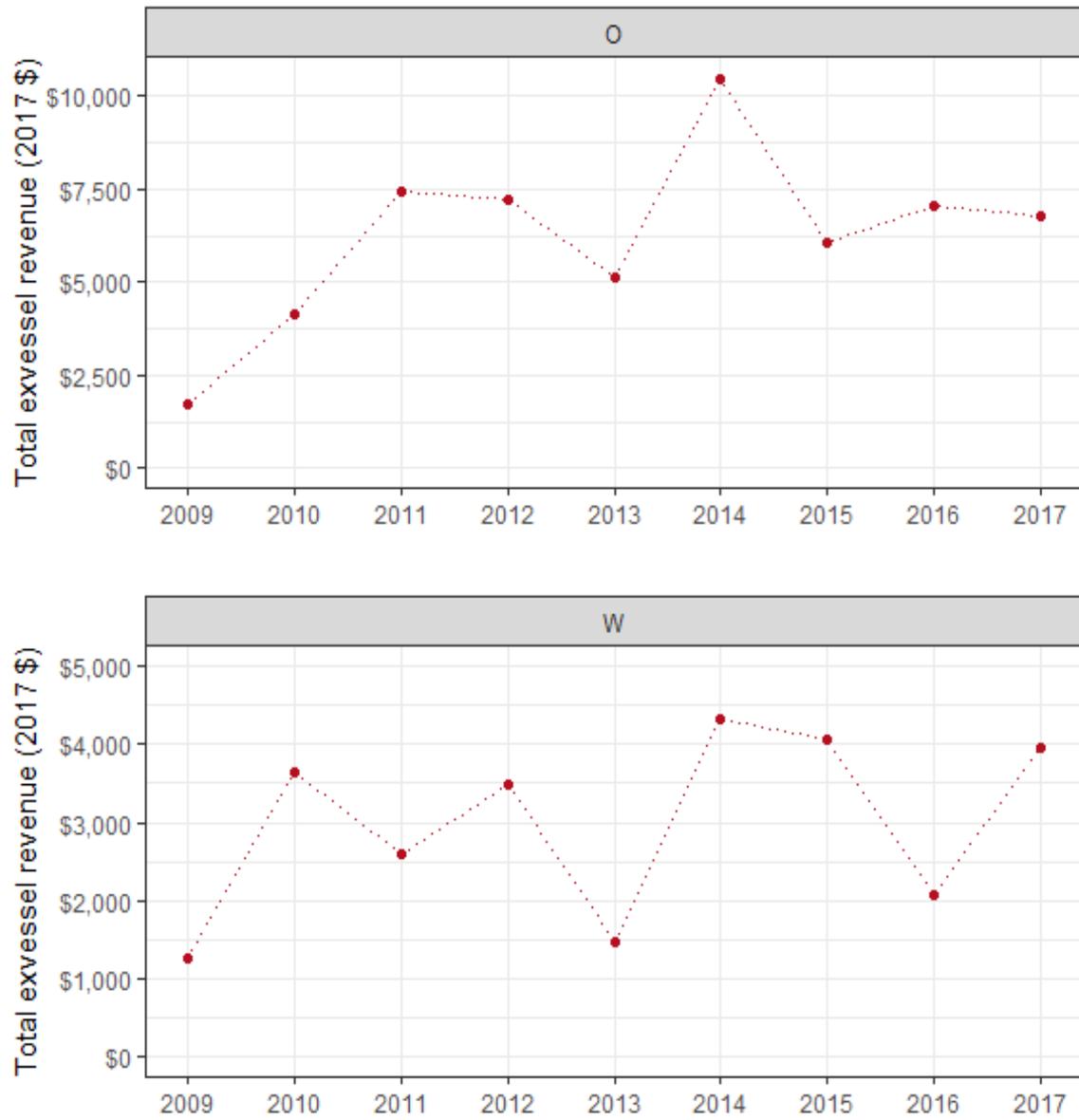


Figure 23. Total lingcod exvessel revenue (2017 \$) by state.

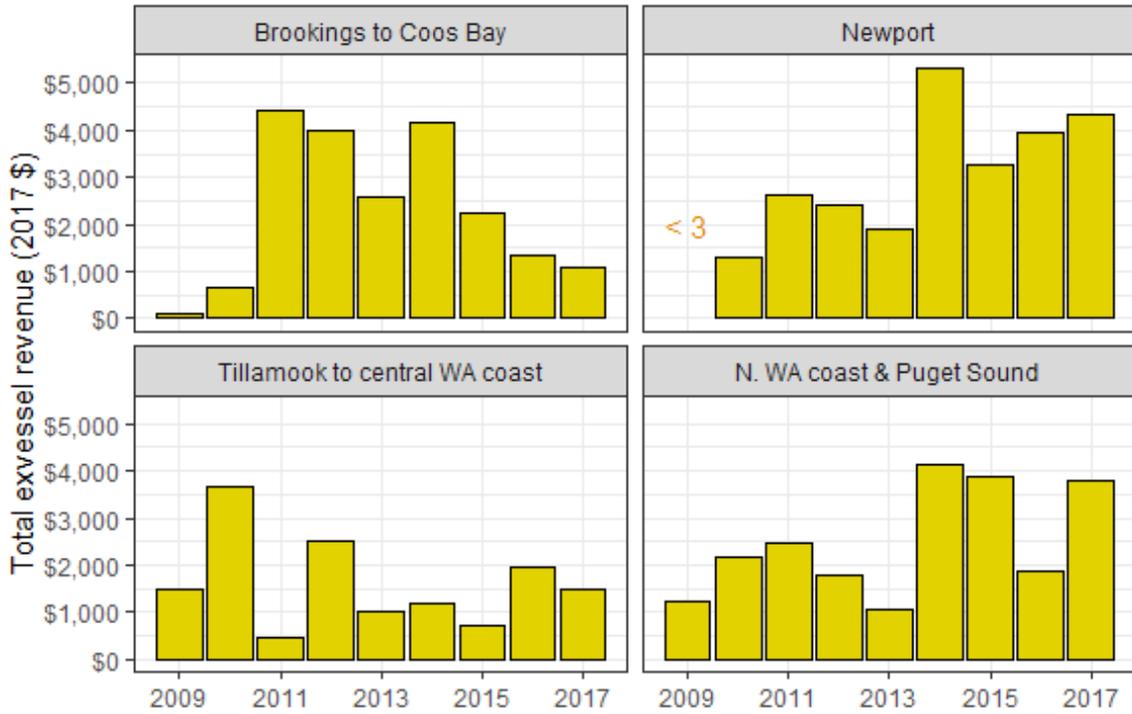


Figure 24. Total lingcod exvessel revenue (2017 \$) by region.

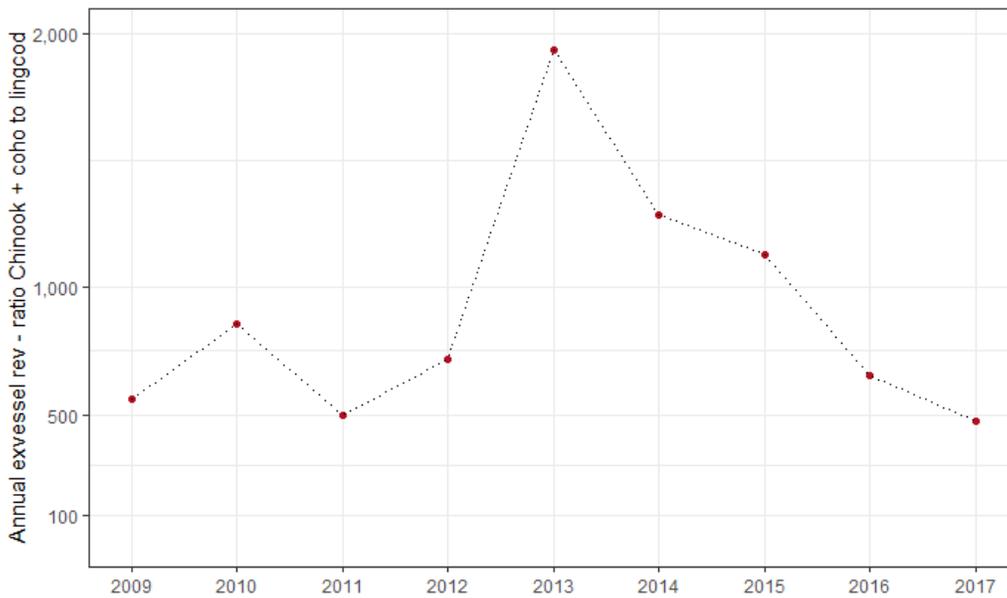


Figure 25. Ratio of annual exvessel revenue earned from Chinook and coho to revenue earned from lingcod.

### 3.1. Lingcod relative to other species

The next two figures show lingcods position relative to other species landed on the same trip as Chinook. Because of the wide disparity in values, the plots use a log base 10 scale on the y-axis. As seen in Figure 26, for Washington vessels lingcod stands a distant third, fourth, or fifth away from salmon and halibut and is on par with revenues from albacore tuna and yellowtail rockfish. The pattern is similar for Oregon vessels, although notably, Pacific halibut revenues are lower than in Washington (Figure 27).

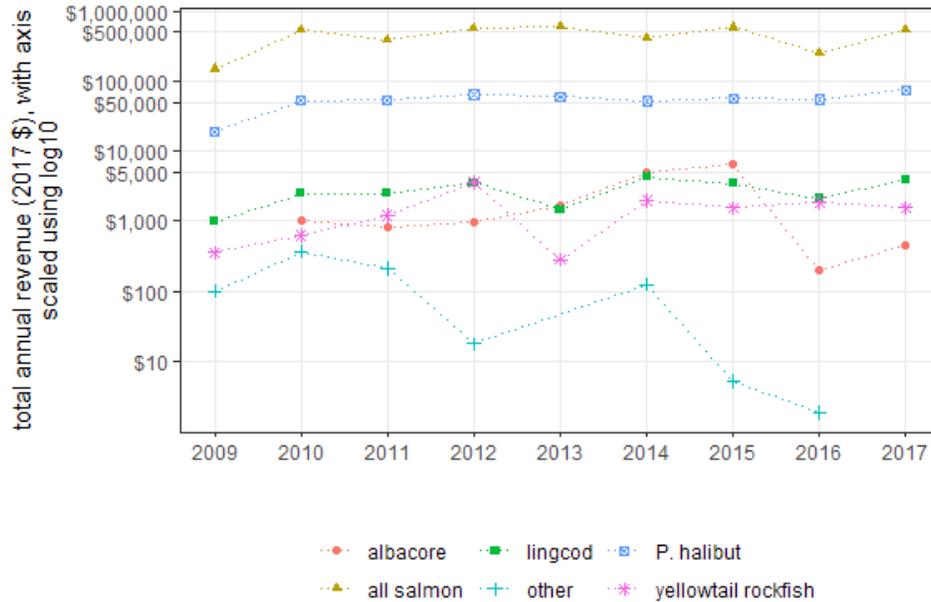
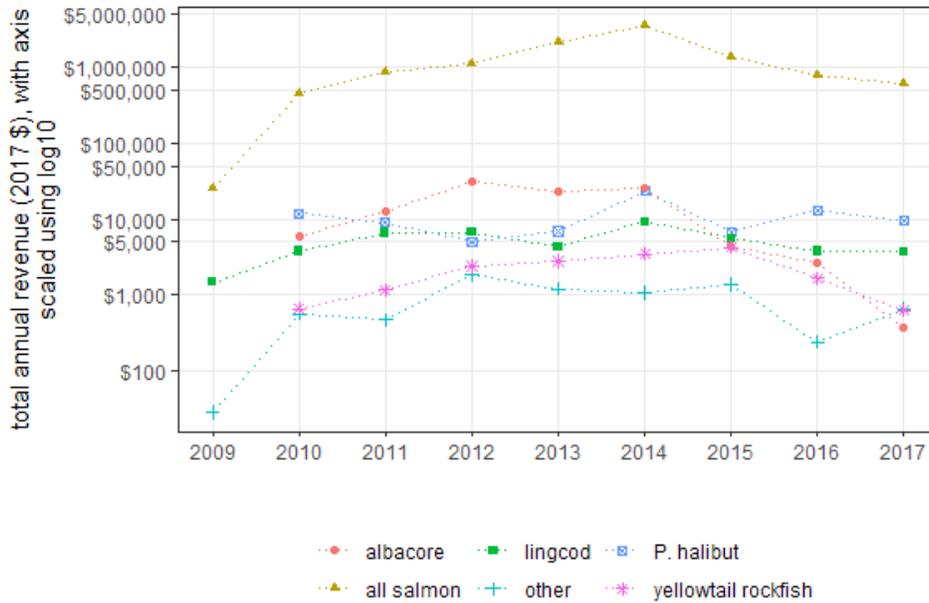


Figure 26. Washington—Total annual revenues from troll vessels that landed lingcod within a season.



**Figure 27. Oregon—Total annual revenues from troll vessels that landed lingcod within a season.**

### 3.2. Vessel level revenues

The figures shown in this section explore the contributions of lingcod revenues to individual vessels. To maintain state level comparisons, vessels that made trips in more than one state in a season are treated as separate (i.e. the vessel appears twice in the data).

Figure 28 summarizes the annual exvessel revenue earned by vessels from troll caught lingcod using the average, and to provide a sense of the upper range, the average of the top three vessels. On average, vessels have earned in the few hundreds of dollars range from lingcod with the average of the top three reaching above \$1,000 in a few years.

Figure 29 summarizes the same information as a percentage of total revenues. As shown, the average in most years is between one and three percent, although this may be difficult to see with the top-three average displayed. The top-three average for Oregon reaches far above the average in several years. The possible reasons for this were not explored. The top-three average is used instead of a measure like the 90th percentile because of the few number of boats landing in Washington (i.e. the 90th percentile, and perhaps even the 75th percentile, may show the activity of fewer than three vessels).

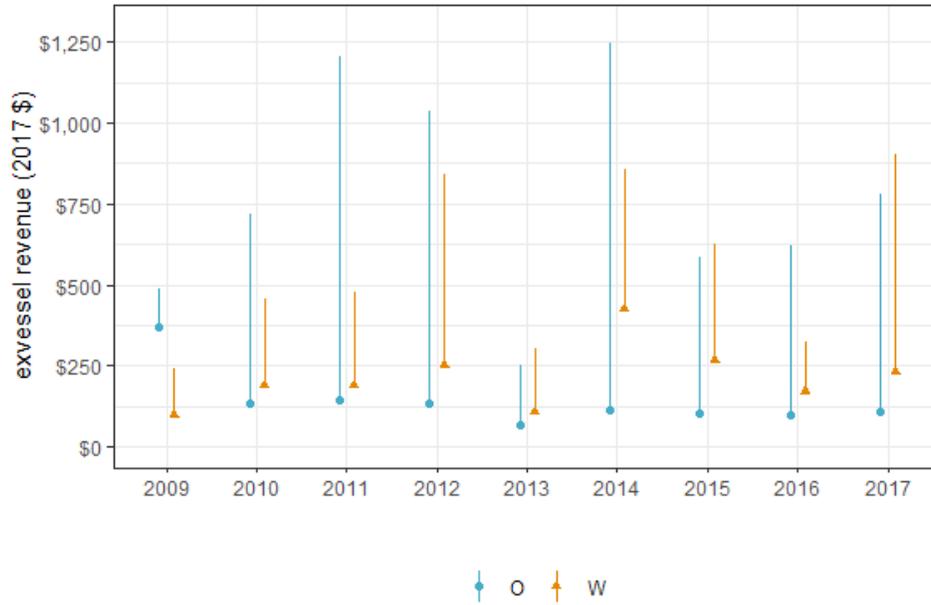


Figure 28. Average annual total vessel revenue from troll caught lingcod with vertical line extending to average of the top three vessels.

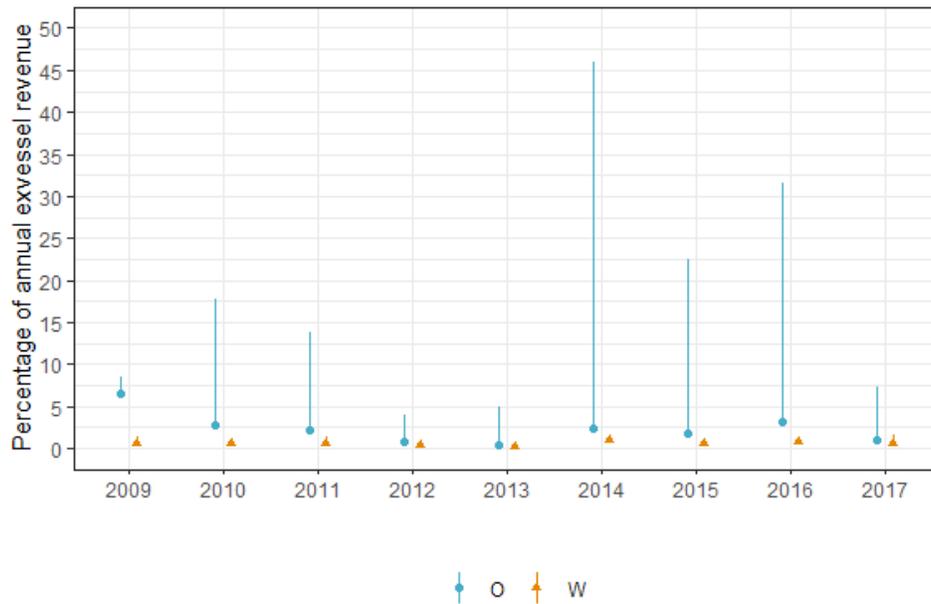


Figure 29. Average percentage of lingcod's contribution to annual vessel troll revenue with vertical line extending to average of the top three vessels.

#### **4. Unquantified Yelloweye Bycatch**

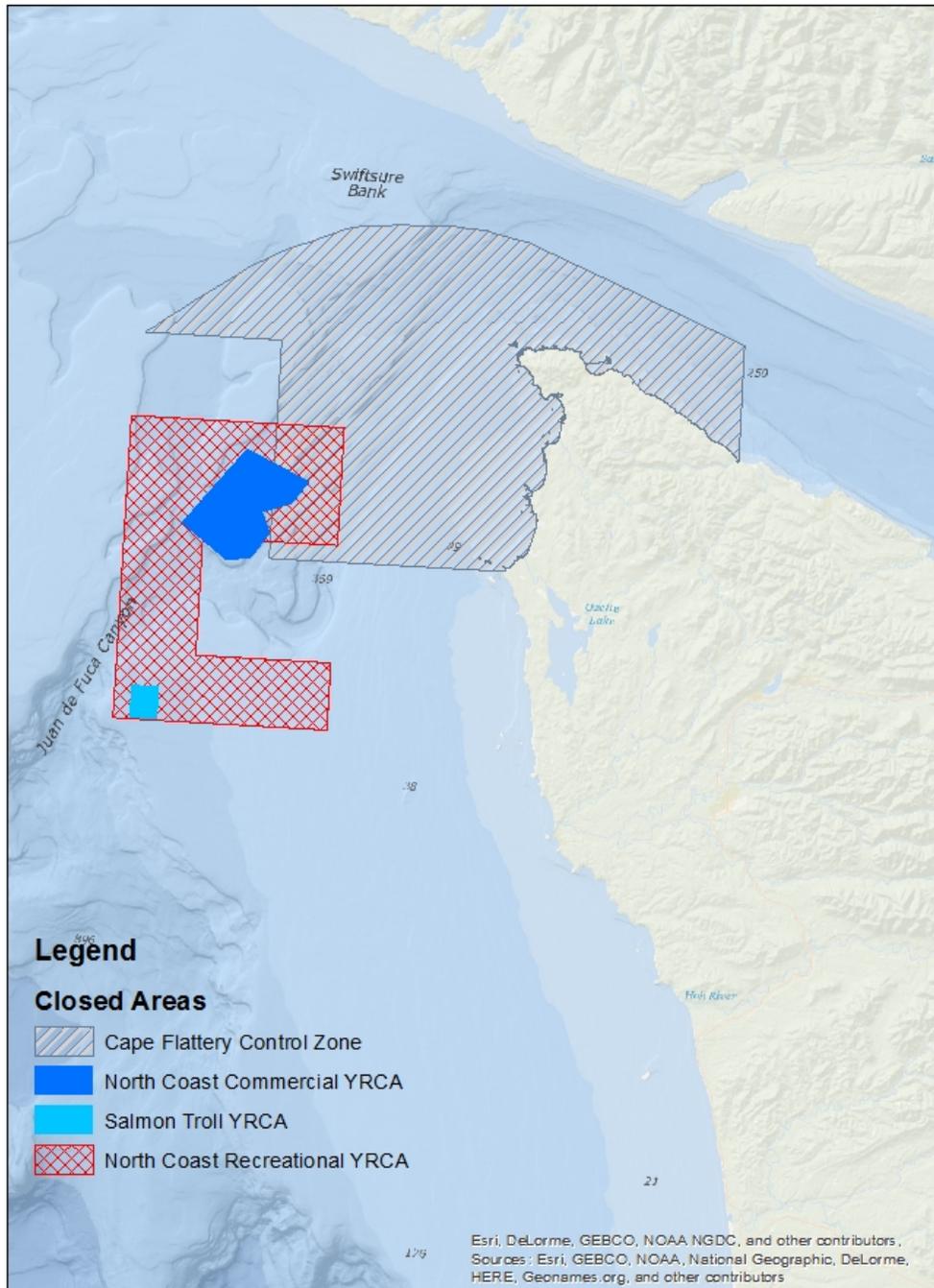
There is no data since 2009 with which to quantify yelloweye bycatch for the troll fleet. The Groundfish Management Team (GMT) had a highly approximate estimate for the troll fleet as part of the incidental open access

While the resolution of Figure 4 may make it difficult to see, the salmon troll fishery overlaps the key depth range for yelloweye and the non-trawl RCA. As part of Washington's marine spatial planning efforts, the key trolling grounds off that state are 20 fm and 60 fm south of the Queets River and between 20 fm and 80 fm north of there. Areas out to 100 fm and in to 10 fm were also described as important. While the same information was not investigated for Oregon and California, the general pattern of troll grounds overlapping yelloweye habitat holds. Looking to West Coast Groundfish Observer Program data for commercial fixed gear fisheries, the probability of yelloweye peaks somewhere between 20 and 100 fm. However, the trollers fish broad areas across these depths and the core habitats for yelloweye are patchy with the species' preferred being the hard substrate habitats that are relatively the rare on the coast. Yelloweye encounters are known to occur but they are not common.

Off Washington, there are mandatory and voluntary closed areas that are intended to mitigate yelloweye bycatch (Figure 30). The Cape Flattery Control Zone, which is place because of Puget Sound Chinook, also effectively closes known yelloweye areas that kept the area closed to bottom trawlers for several years.

The lack of a yelloweye bycatch estimate for the troll fleet is one the Council should consider addressing regardless of the decision on this management measure adjustment. Without direct observations of yelloweye discard, the estimate can only be a proxy estimate based on assumed rates of encounter. As part of this analysis, WDFW attempted some cursory proxy estimates and saw they can range widely, from less than 0.1 mt to over 1 mt. Close scrutiny of an appropriate proxy estimate is something the Council should consider.

The focus of this analysis is on comparing the effects of Alternative 1 and No Action. For the effects on yelloweye bycatch to change between the two there would need to be a difference in either effort or catch per unit effort. Alternative 1 seems unlikely to have an effect on total fishing effort (CPUE). Salmon opportunities will continue to be what causes ups and downs in the number of trips each year. And, as highlighted in the overview, for Alternative 1 to cause a change in CPUE would require inducing differences in fishing behavior. There is no means of quantifying such a change. With the few number of lingcod Alternative 1 would make available and the relatively small revenues lingcod have provided trollers, major changes in fishing behavior seem unlikely. Yet as highlighted, the matter is uncertain and open judgment. The incentive could have a marginal effect on some vessels or it is possible that there are no differences at all on yelloweye bycatch from allowing the incidental lingcod allowance because fishing behaviors are driven by the primary targets of Chinook and coho.



**Figure 30. Map of voluntary and mandatory closures for the salmon troll fishery in key yelloweye habitats off northern Washington.**

## 5. WDFW Responses to Appendix C Questionnaire

### 1. *Describe the new management measure.*

Please see the Overview section above for a description of the management measure adjustment. It applies to the ocean salmon troll fishery north of 40 10 N. degrees latitude and allows trollers to retain lingcod based on a ratio of Chinook caught and other restrictions. The No Action ratio is one lingcod per 15 Chinook. The proposed adjustment, referred to as Alternative 1, is one lingcod per 5 Chinook. Both the No Action and Alternative 1 ratios are subject to other restrictions, such as the lingcod minimum size limit, a maximum of ten lingcod per trip, and the monthly lingcod landing limit.

The determination that this is a new management measure was made based on the previous analysis in 2008. From the practical standpoint, the analysis is focused on adjusting the existing lingcod per Chinook ratio based on new information and circumstances. That is, the goals of the management measure remain the same and changed circumstances have warranted consideration of how well the existing ratio is performing. In brief, salmon trollers have testified to an increased rate of lingcod encounters as Chinook harvest opportunities have been on the decline. If true, then more regulatory discard of lingcod could be occurring than desired.

There was interest expressed among Council members and the public of making the ratio adjustments a matter of routine action in the future. It is assumed that would be the Council's intent if the management measure is forwarded.

### 2. *What was considered in order to optimize the performance of this measure?*

The goal of the existing lingcod per Chinook ratio is to allow trollers to keep lingcod that they catch incidentally when fishing for salmon. The existing ratio was put into place because salmon trollers are not excluded from the non-trawl Rockfish Conservation Area (RCA). Without the ratio, or with a ratio that is too liberal compared to the natural rate of encounter with lingcod, the potential for lingcod targeting within the RCA would be of concern. Allowing targeting of lingcod is of concern because of the yelloweye rockfish bycatch that is associated with lingcod targeting, an association across multiple commercial and recreational groundfish fisheries, and out of considerations of fairness and equity about allowing a non-groundfish sector target a key groundfish stock in an area that is closed to groundfish fisheries. On the other side of the equation, without the incidental allowance or with a ratio is set too strictly relative to the natural rate of encounter, then trollers are forced to discard lingcod and forgo revenues for no conservation gain.

Setting the ratio optimally to the incidental rate of encounter is not possible given the lack of data and variability in catch rates from year to year. The decision on setting the ratio is one of policy judgment focused on balancing the risk of targeting with the issues of creating unnecessary regulatory discards. The risk of incentivizing trollers to seek out lingcod and possibly increase yelloweye bycatch, which is currently unquantified, is also relevant to the Council's decision on whether to revise the yelloweye rebuilding plan.

### 3. *What and when was the Council's decision and how did it arrive at the decision?*

The No Action ratio was analyzed and went into place with the 2009-2010 management measures. The adjustment being considered here was proposed by the Salmon Advisory Subpanel for inseason action at the March 2018 meeting. When inseason action was deemed inappropriate,

the Council added the adjustment to the 2019-2020 management measures package at the April meeting. The Council’s choice between Alternative 1 and No Action will happen at the June 2018 meeting.

4. *Is there any other background information that was important to the Council’s decision? For example, has this measure been previously discussed by the Council, if so what was the outcome?*

The Council has yet to make its recommendation and is expected to do so at the June 2018 meeting. The main body of this WDFW report summarizes lingcod catches and revenues over 2009-2017 to help the Council understand the level of participation and activity and to gauge the risk that increased lingcod allowance may lead to changed fishing strategies for targeting or at least increasing encounters with lingcod. Again, the incidental lingcod analysis was last considered in 2008 as part of the 2009-2010 management measures analysis. This is the first reevaluation of the ratio since then.

**Part B**

*For reference:*

Definitions:
<ul style="list-style-type: none"> <li>• Effect (40 CFR 1508.8) - (a) Direct effects, which are caused by the action and occur at the same time and place. (b) Indirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems. Effects and impacts as used in these regulations are synonymous. Effects includes ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those resulting from actions which may have both beneficial and detrimental effects, even if on balance the agency believes that the effect will be beneficial.</li> </ul>
<ul style="list-style-type: none"> <li>• Mitigation (40 CFR 1508.20) - (a) <i>Avoiding</i> the impact altogether by not taking a certain action or parts of an action. (b) <i>Minimizing</i> impacts by limiting the degree or magnitude of the action and its implementation. (subparts c-e generally not applicable to Management Measures in Specs).             <ul style="list-style-type: none"> <li>○ Examples: ensure that the Harvest Guideline or ACL is not exceeded; reduce bycatch of target or non-target species; or reduce encounters with protected resources such as ESA listed fish, seabirds, or marine mammals or turtles.</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>• Significant (40 CFR 1508.27) - Significantly as used in NEPA requires considerations of both context and intensity: (a) Context. This means that the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance would usually depend upon the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant. (b) Intensity. This refers to the severity of impact.</li> </ul>
<ul style="list-style-type: none"> <li>• Human Environment (40 CFR 1508.14) - Human environment shall be interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment. (See the definition of “effects” ( § 1508.8).) <i>This means that economic or social effects are not intended by themselves to require preparation of an environmental impact statement.</i> When an environmental impact statement is prepared and economic or social and natural or physical environmental effects are interrelated, then the environmental impact statement will discuss all of these effects on the human environment.</li> </ul>

1. *What is the objective of this management measure?*
  - *Does it have a conservation purpose? (e.g., managing catch within ACLs? mitigating impacts to habitat or protected species?) Does it have a social/economic purpose? (e.g., allowing increased opportunity to catch target species? Does it have a social making fishing opportunity among different user groups more equitable?)*

As with many decisions in fisheries management, this management measure decision is about providing opportunity for economic and social benefits consistent with policies for conservation and fair and equitable sharing. As noted above, the goal is to allow salmon trollers to earn revenue from incidentally caught lingcod while mitigating the risk that lingcod are targeted within the non-trawl RCA.

2. *The following screening is intended to help NMFS understand the broad implications of the management measure and to determine the appropriate NEPA compliance strategy.*
  - a. *How would you describe this new management measure (may select more than one)*
    - Technical correction or a change to a fishery management action or regulation, which does not result in a noticeable change in any of the following: fishing location, timing, effort, authorized gear types, or harvest levels.*
    - Has potential for noticeable change to any of the following: fishing location, timing, effort, authorized gear types, or harvest levels.*
    - Designed to mitigate some other environmentally negative effect (e.g., cap, closed area, bag limit).*
    - Designed to mitigate a negative economic or social effect.*
    - Applies to only a small area of the total EEZ.*

The first, second, and fourth bullets apply to some degree, and possibly the third. The question of whether there will be a noticeable change in fishing behaviors cannot be quantified. As mentioned, it is a matter of risk and policy judgement that the Council can qualitatively consider the potential by looking to the amount of participation and size of lingcod's economic contribution to overall revenues for salmon trollers. Only between 10 and 20 percent of trollers have landed lingcod each year over 2009-2017. This would suggest that the potential for changed fishing behavior would be relatively minor if it exists.

In some sense, this is also a measure for mitigating the need to limit the retention of groundfish within the non-trawl RCA and the key salmon trolling grounds. Without those measures, salmon trollers would retain groundfish to a greater degree.

- b. *What resource(s) would the management measure likely effect, either positively or negatively?*
      - Physical EFH or Ecosystems*
      - Biological Resources (target, non-target species)*
      - Protected Resources (mammals, ESA-listed)*
      - Economic, social, cultural*

The potential increased harvest of lingcod is minor relative to the ACL, which is expected to be in the 4,000 mt range with large surpluses between the ACL and harvests continuing. The highest year over 2009-2017 saw troll landings of 4 mt of lingcod. So even a doubling or tripling, the likelihood of which is unknown, would not be of concern.

The question of whether other resources would be affected depends on what is concluded about the potential for changed fishing behavior. If lingcod remain incidental to salmon trolling, there are no additional impacts to any of the resources noted. If lingcod targeting increase, there could be increased catches of yelloweye rockfish. The risk of increased yelloweye catches is most relevant to the Council's consideration of the yelloweye rebuilding plan. While unquantified, yelloweye bycatch is unlikely to be large enough to change rebuilding projections under the latest

rebuilding analysis. Evaluation of yelloweye bycatch in the salmon troll fishery is a potential need regardless of what the Council chooses here.

Salmon seasons are largely set out of the need to protect ESA-listed salmon populations and other weak stocks. The NMFS of Fisheries for 2018, created under the Marine Mammal Protection Act (MMPA), lists the WA/OR/CA salmon troll fishery as Category III with no documented mammal species and/or stocks incidentally killed or injured.

The adjustment to the lingcod to Chinook ratio could have a positive effect on the revenues of individual participants in the salmon troll sector, although lingcod revenues a minor percentage in the troll sector overall.

- c. *If the management measure is mitigating or offsetting an effect on a resource, identify that resource.*
- Physical EFH or Ecosystems*
  - Biological Resources (target, non-target species)*
  - Protected Resources (mammals, ESA-listed)*
  - Economic, social, cultural*

Again, the incidental allowance could be viewed by some as seeking to offset the forgone revenue caused by regulatory discards of lingcod.

*Part C – Keeping in mind the responses provided in part 2 above, briefly answer the following questions. Please focus on the issues of importance; if there are no potential effects, say ‘no anticipated effects’. Remember both positive and negative effects.*

1. *Groundfish*

- a. *How does any change in catch relate to harvest specifications and the risk that overfishing will occur? Can the proposed measure reasonably be expected to adversely affect managed fish species?*

The effects of this management measure on lingcod and yelloweye rockfish are minor relatively to catches overall. The lingcod ACL is considerably larger than expected total fishing mortality. The risk on yelloweye rebuilding is best considered as part of the rebuilding plan. Again, if lingcod catch is incidental, then there is no additional effect on yelloweye rebuilding. Trollers will catch and discard yelloweye regardless of whether the Council adjusts the per Chinook ratio limit.

- b. *Will this management measure change catch of groundfish stocks compared to past catches and management reference points? If no, describe in a few sentences why not. If yes, what stocks would be substantially affected?*

If Alternative 1 is chosen, lingcod fishing mortality would increase marginally because a portion of the lingcod that would have been thrown back would instead be landed. Lingcod do not suffer from barotrauma. Fishing mortality estimates use a mortality rate of 7 percent. Lingcod discards are not currently quantified in the salmon troll sector. Again, any change would minor. Whether yelloweye mortality would increase depends on whether trollers would increase targeting of lingcod. With the management uncertainty involved with yelloweye catches, it would be unlikely that this ratio adjustment would have an appreciable change on rebuilding reference points. Under the current rebuilding analysis, catches that differ by 10 mt only change rebuilding projections by one year.

## 2. *Other Fish*

- a. *Will this management measure affect catch of nongroundfish species? If no, describe in a few sentences why not. If yes, is the magnitude of the change substantial and to what stocks? How is this catch monitored? Are the affected stocks managed under another federal FMP or by a state? Do other management plans include harvest specifications? Is it possible to assess the contribution of the measure, if any, to overfishing risk of a nongroundfish stock?*

No, the adjustment would not be expected to affect catch of nongroundfish species. Salmon troll gear interacts catches relatively few species.

## 3. *EFH and Ecosystems*

- a. *Will this management measure change fishing activity so as to adversely affect essential fish habitat compared to no-action effects? If no, describe in a few sentences why not. If yes, is the magnitude of the change substantial and why? Describe the mechanism linking the management measure to adverse impacts. For example, changes in fishing gear or methods; changes in the temporal and/or geographic distribution fishing effort.*

Salmon troll gear is not thought to have an adverse effect on EFH.

- b. *Can the proposed measure reasonably be expected to adversely affect vulnerable marine or coastal ecosystems, including but not limited to, deep coral ecosystems?*

Again, salmon troll gear has a light footprint and is not thought to interact substantially with benthic habitats.

- c. *Can the proposed measure reasonably be expected to adversely affect biodiversity or ecosystem functioning (e.g., benthic productivity, predator-prey relationships, etc.)?*

Lingcod's role as a predator is a topic of research and public interest. It is often speculated that lingcod's recovery and increasing population growth could be having an adverse impact on rebuilding rockfish populations. It would be ideal to consider the recovery of predators and prey together.<sup>5</sup> However, with the scientific uncertainty involved and small amount of lingcod harvested by trollers, the trophic effects of the ratio adjustment are not a prominent factor in the Council's decision.

## 4. *Marine Mammals and ESA Species*

- a. *Will this management measure result in adverse effects to ESA-listed species and/or non-listed marine mammals and seabirds? If no, describe in a few sentences why not. If yes, is the magnitude of change substantial and why? Describe the mechanism linking the*

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<sup>5</sup> Oken, Kiva L. and Timothy E. Essington; Evaluating the effect of a selective piscivore fishery on rockfish recovery within marine protected areas, *ICES Journal of Marine Science*, Volume 73, Issue 9, 1 September 2016, Pages 2267–2277, <https://doi.org/10.1093/icesjms/fsw074>;

Samhouri, Jameal F., Adrian C. Stier, Shannon M. Hennessey, Mark Novak, Benjamin S. Halpern, and Phillip S. Levin. "Rapid and direct recoveries of predators and prey through synchronized ecosystem management." *Nature ecology & evolution* 1, no. 4 (2017): 0068. <https://www.nature.com/articles/s41559-016-0068>.

*management measure to adverse impacts. For example, changes in fishing gear or methods; changes in the temporal and/or geographic distribution fishing effort.*

As noted, the salmon troll fishery is intensively managed for impacts on ESA listed salmon populations and marine mammal interactions have not been documented. Troll gear is not known to pose risk to seabirds. Again, it is very possible that lingcod retention has negligible effect on fishing behaviors.

5. *Social and Economic*

- a. *Will this management measure change the distribution of catch opportunity among user groups, fishing communities, states, or regions? If no, describe in a few sentences why not. If yes, is the magnitude of the change substantial? Why is it substantial? For example, which user groups are likely to see increased catch opportunity? Which may lose catch opportunity?*

The lingcod harvested by the salmon troll fishery does not raise the need to consider allocations or other fair and equitable sharing mechanisms.

- b. *Can the proposed action reasonably be expected to significantly affect public health or safety?*

No, there is no reason to believe the ratio adjustment would affect public health or safety.

6. *Cumulative effects*

*Past fishery and non-fishery actions have created the baseline conditions. For fishery management actions, consider current (put into place recently but the effects may not be visible) or “reasonably foreseeable future items (actions that the Council is moving forward with). For Specs, consider the 19/20 preferred alternative and the routine management measures.*

*Repeat each set of questions for affected resources (Groundfish, other fish, EFH, ecosystems, ESA species, marine mammals, social, and economic).*

- a. *Does the proposed management measure have non-negligible adverse effects to the resource? If none then stop and proceed to the next resource.*
- b. *Is it likely that any current or future fishery management actions may have overlapping effects with this management measure on the resource?*
- c. *Is it likely that any current or future non-fishery management actions may have overlapping effects with this management measure on the resource?*
- d. *Qualitatively or quantitatively, add the effects in (a), (b), and (c) projected to the end of 2020. Can the sum of the effects be considered ‘significant’? Consider both positive and negative effects.*

The groundfish fisheries in total have not been determined to cause significant impact to the California Current marine ecosystem or any of its resources. The likely effects of this management measure are not of the degree that would change these past conclusions. The most prominent effects would arise from the harvest of lingcod and yelloweye rockfish, and the effect of troll harvest on either are likely minor on the yelloweye rebuilding plan and on lingcod. The ratio adjustment would marginally increase revenues to troll fishers that choose to participate. Lingcod revenues contribute a small proportion of revenues in the troll fleet.

- e. Whether significant or not, what is the proposed new management measure's contribution to the total effect? E.g., the incremental impact from this management measure to the cumulative effects on groundfish is negligible/high/medium

Again, the effect of this management measure are small contributions to the policies set for the lingcod ACL and yelloweye rebuilding plan. The incremental impact is not expected to be substantial within the larger harvests of those two species.

7. *Other*

- a. *Are the proposed action's effects on the quality of the human environment likely to be highly controversial? (science of the effects, not the perception)*

*No, the effects are largely unquantifiable but not controversial.*

- b. *Are the proposed action's effects on the human environment likely to be highly uncertain or involve unique or unknown risks?*

They are uncertain but not highly uncertain and subsumed by the larger effects of the Council's management of the salmon and groundfish fisheries.

8. *MSA National Standards*

- a. *Describe how the management measure is consistent with the 10 MSA National Standards.*

- i. *(1) Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.*

The potential adjustment to the lingcod per Chinook ratio can be viewed as fitting in with consideration about optimal yield for lingcod and rebuilding policies for lingcod and yelloweye rockfish. Food production, which troll caught lingcod contribute to, is one part of the definition of optimum yield. Again though, the troll sector contributes a minor portion of the total harvest of these species.

- ii. *(2) Conservation and management measures shall be based upon the best scientific information available.*

The analysis uses the best available information on landed catch via the Pacific States Marine Fisheries Commission's PacFIN database.

- iii. *(3) To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.*

National Standard 3 is not relevant.

- iv. *(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.*

The management measure fits within existing allocation and sharing policies for lingcod and will be considered as part of the yelloweye rebuilding.

- v. *(5) Conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resources; except that no such measure shall have economic allocation as its sole purpose.*

Allowing retention of incidental catch would contribute to efficiency of harvest as the benefits of harvest are achieved for little if any extra cost on top of what is expended to fish for the target stocks. As noted, there are countervailing conservation and fair and equitable considerations that some may emphasize over efficiency in the costs of harvest.

- vi. *(6) Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.*

One intent of this proposed management measure adjustment is to take into account variations caused by increases in lingcod abundance and fluctuating Chinook populations which influence the incidental rate of encounter. Lingcod are thought to be increasing in abundance since 2009 whereas Chinook have gone through swings. Trip limits are imperfect tools and often require adjustment based on feedback on performance. The proposal here would be intended to make the lingcod per Chinook ratio adjustable on more of a routine basis.

- vii. *(7) Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.*

As noted in the WDFW report, the Council generally allows incidental catch of marketable species to be retained unless there is an offsetting conservation or fair and equitable sharing purpose for prohibiting retention. This is one key way to frame the Council's choice on adjusting the ratio. The benefits of discouraging targeting of lingcod inside the RCA are weighed against the costs of forgone revenues to trollers.

- viii. *(8) Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities by utilizing economic and social data that meet the requirements of paragraph (2), in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities.*

National Standard 8 is relevant as revenues available from lingcod contribute to the revenues of the troll fleet and the fishing communities they operate in. However, the potential for increased yelloweye bycatch would be more directly consider as part of the rebuilding plan and the "needs

of fishing communities”, fair and equitable sharing of recovery restrictions and benefits, and other factors the Council considers when recommending rebuilding harvests.

- ix. (9) Conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.*

Bycatch is of relevance to the evaluation of the lingcod to Chinook ratio adjustment. However, the bycatch considerations are likewise more directly considered as part of the yelloweye rebuilding plan.

- x. (10) Conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.*

The lingcod retention allowance is not expected to influence the choices and circumstances that affect safety at sea among salmon trollers.