OREGON DEPARTMENT OF FISH AND WILDLIFE INFORMATIONAL REPORT REGARDING SPECIATION OF UNSPECIFIED ROCKFISH LANDINGS IN OREGON FOR INCLUSION IN STOCK ASSESSMENT TIME SERIES OF REMOVALS

Introduction

The purpose of this report is to document and inform the Council and stock assessors that the Oregon Department of Fish and Wildlife has completed a commercial catch reconstruction to account for rockfish from unspecified landing categories from 1987-1999. Since time series of removals are a core and influential input for all stock assessment types, one of the main recommendations from the 2016 Catch Reconstruction Workshop was for the states to account for unspecified landings else removals would be underestimated.

For Oregon, it was determined that stock assessments were typically not accounting for 7,242 metric tons (mt) of commercial rockfish landings from 1987-1999 that reside in unspecified categories on PacFIN (i.e., URCK and POP1). These unspecified URCK and POP1 landings are not an issue after 1999 due to market category evolutions, and were resolved prior to 1987 in the Historical Reconstruction of Oregon's Commercial Fisheries Landings (hereafter referred to as the "Karnowski et al. (2014) reconstruction"). The remainder of this report provides greater information regarding the URCK and POP1 issue and resolutions from 1987 - 1999.

It is important to account for these unspecified commercial rockfish landings since the total magnitude of the landings are high (7,242 mt) as well as the relative contribution of these landings to total rockfish landings in Oregon. For example, the combined URCK and POP1 landings in 1987 (917 mt) were 6.1 percent of the total Oregon rockfish landings (15,049 mt total; 14,640 mt commercial; 409 mt recreational). Of greatest note is that the reconstructed landings of individual rockfish species from URCK and POP1 are relatively high compared to PacFIN species estimates that are used for landings in stock assessments (discussed in results section).

Accordingly, ODFW staff completed a catch reconstruction to speciate the unspecified URCK and POP1 Oregon landings for inclusion in stock assessments. Upon completion, it was determined that Oregon commercial landings may have been underestimated for 42 species of rockfish in the past.

This report documents the methods and results of this reconstruction effort to speciate unspecified URCK and POP1 landings for Oregon only. While the other states also have unspecified landings they are working to resolve, it was noted during the 2016 Catch Reconstruction Workshop that these reconstruction efforts will have to be state-specific given differences in survey designs, market category histories, estimation procedures, etc. As such, the methods used to speciate Oregon's URCK, for example, would not be appropriate for speciating Washington's URCK.

Background: What are Oregon's URCKs and POP1s?

There is a misconception that URCK are unknown rockfish and POP1 are nominal landings of Pacific ocean perch. In reality, they are used by PacFIN to represent nominal landings from ODFW's historical multi-species market categories that no longer exist.

Prior to 2000, rockfish that did not have their own market categories were sorted by size class: Other Rockfish (410) for large rockfish and Nominal POP (406) for small rockfish (Figure 1). If landings of these market categories occurred within a stratum that contained an associated species composition, then those multi-species market category landings were speciated and made available via species queries on PacFIN.

However, if those market category landings occurred within a stratum without an associated species composition, then those landings were not speciated and remained nominal. Nominal landings of ODFW's Other Rockfish (410) were denoted by PacFIN as URCK, and species composition samples indicate that this category mainly consisted of nearshore and shelf rockfish species. Nominal landings of ODFW's Nominal POP (406) were denoted as POP1, and species composition samples mainly consisted of shelf and slope rockfish species. However, since these market categories were based on fish size, there was overlap in the species contributing to each.

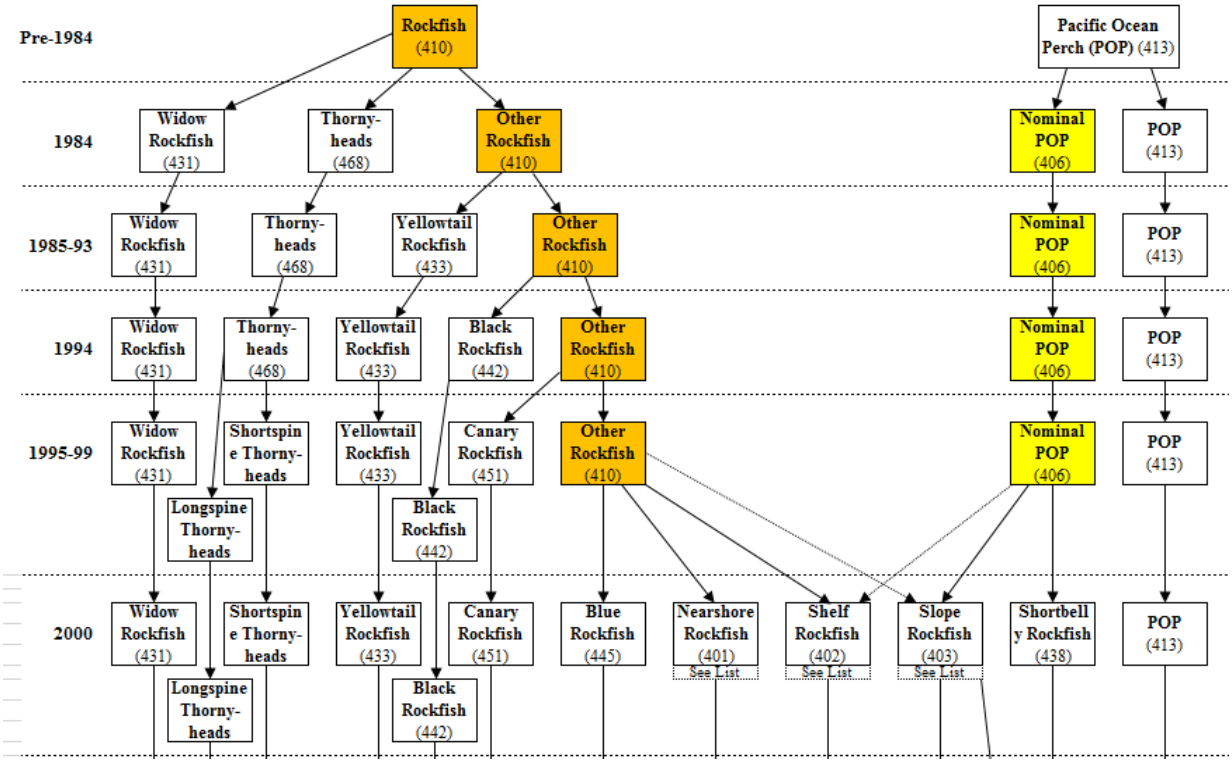

Figure 1. Historical ODFW rockfish market categories. URCK are nominal landings of ODFW's Other Rockfish (410) category (orange) and POP1 are nominal landings of ODFW's Nominal POP (406) category (yellow).

URCK and POP1 were prevalent in Oregon for two reasons: (1) species composition samples were low (especially for non-trawl gear) given the fine-scale stratification (category, year, port, quarter, grade, area, gear) used for applying species compositions to market category landings,

which resulted in many strata with landings not having an associated species composition and (2) borrowing rules were not broad enough to acquire species compositions for strata that contained landings but were missing species composition samples.

Since stock assessors who obtain landings from PacFIN typically query by species (e.g., yelloweye rockfish and nominal yelloweye rockfish), landings of individual species buried within the multi-species URCK and POP1 species codes have been unaccounted for in assessments to date. Even if one is aware of the need to account for these landings, properly speciating them is challenging given the breadth of historical knowledge needed in regards to evolution of market categories, sampling and estimation procedures, and other potential issues.

Resolution: Speciation of URCKs and POP1s

To develop time series of species specific landings, the Karnowski et al. (2014) reconstruction: (1) determined annual landings at the finest resolution possible (e.g., market category-, gear-, port-, and year- specific); (2) similarly compiled species compositions at the finest level possible; and (3) reconstructed species specific landings by applying the (post) stratified species compositions to respective category landings. This reconstruction effort to speciate URCK and POP1 was essentially an extension of the Karnowski et al. (2014) reconstruction since the same general methods were used:

(1) URCK and POP1 fish tickets (landings) were extracted from PacFIN
(2) Matrices of URCK and POP1 landings were made by the same strata (market category, gear, port, year) as used in the Karnowski et al. (2014) reconstruction
(3) Similar matrices were made for species composition samples from:
    a) ODFW's Other Rockfish (410), corresponding with URCK
    b) ODFW's Nominal POP (406), corresponding with POP1
(4) The matrices of landings that needed to be speciated were compared with the matrices of available species compositions to determine which landings strata were missing species compositions
(5) If species composition samples were absent or sample sizes were low for a given landings stratum ($n<5$), then species compositions were pooled to fill that landings stratum based on the following approach:
    a) Year: <u>First factor to be pooled</u> due to similarity across years for given ports & gears
        i) Pooling was confined to year blocks with consistent market category definitions
        ii) Species specific market categories established for black rockfish in 1994 & canary rockfish in 1995 necessitate using three separate and distinct year blocks from which not to pool across: (1) 1987-1993; (2) 1994; and (3) 1994-1999
    b) Nearest Port: Second factor for pooling due to increased dissimilarity in species compositions due to latitudinal variation in species ranges (e.g., yellowtail rockfish more prevalent northward) and to better facilitate area specific models (rarely used for trawl types, but common for non-trawl).
    c) Gears: Last source for pooling due to different selectivity and markedly dissimilar species compositions
        i) Pooling did not occur across major gear types, but did occur across different configuration types for a given gear.

d) For non-trawl gears, pooling across year, port and gear did not always produce the minimum species composition sample size goal (n=5), in which case available samples were used. At least one pooled species composition sample existed for every landing strata, except for those of troll gear and crab pots (explained below).

(6) If pooling was used, the pooling rule was documented in a "comment" field to better facilitate future evaluation or modifications if desired.

(7) The PacFIN URCK and POP1 landings were speciated using the stratified or pooled compositions.

The main difference between this effort and the Karnowski et al. (2014) reconstruction is that this reconstruction used species compositions from the same time period, whereas the Karnowski et al. (2014) reconstruction often had to apply species compositions from later eras (e.g., 1990's) to earlier landings (e.g., 1970's). One would therefore expect these speciated URCK and POP1 landings to be more certain than reconstructed Oregon commercial landings from earlier eras.

The level of aggregation is another major difference between these reconstruction efforts. This reconstruction applied species compositions at the ticket level, whereas the Karnowski et al. (2014) reconstruction applied species compositions to aggregated yearly landings. Applying species compositions at the ticket level was advantageous since all the desired PacFIN fields utilized by assessors were maintained. As a result, it allows these speciated URCK and POP1 landings to be easily added to existing species specific landing estimates from PacFIN seamlessly, until this reconstruction can be fully incorporated into PacFIN. For instance, in the interim, a stock assessor wanting to obtain full commercial landings of yelloweye rockfish would use a PacFIN query for "yelloweye rockfish" + "nominal yelloweye rockfish", and then merge and aggregate those landings with the speciated yelloweye rockfish landings from URCK and POP1 from this reconstruction directly.

As mentioned above, there were no species compositions available for commercial troll gear. The same problem impacted the Karnowski et al. (2014) reconstruction since no commercial troll rockfish species composition exist from any era. As such, the Karnowski et al. (2014) reconstruction used the composition of estimated sport troll landings as a proxy for commercial market compositions. This reconstruction used the same sport landing estimate compositions, but with modifications to ensure that the contributing species properly matched the species that were supposed to contribute to the historical market categories. For example, for 1994 troll species compositions, when black rockfish were given their own category, black rockfish landings used to generate species composition proportions by the Karnowski et al. (2014) reconstruction were removed and proportions were recalculated. Landings that were caught with crab pots (8.8 mt) were not speciated as there are no available species compositions for rockfish caught with crab pots and we were unable to identify any proxy sources of information.

Issues with unspecified rockfish landings in Oregon were greatly diminished after 1999, mainly due to evolution of market categories away from multi-species categories. Since most species of rockfish commonly encountered by Oregon commercial fisheries now have their own market category (Figure 2), nominal landings are now specific to individual species instead of multi-species groupings. Since dealers have been relatively proficient at sorting landings to these market categories of individual species (i.e., >98% accurate/pure for most), there is a high degree

of confidence that nominal landings of today are mainly of the market category that species belongs to.

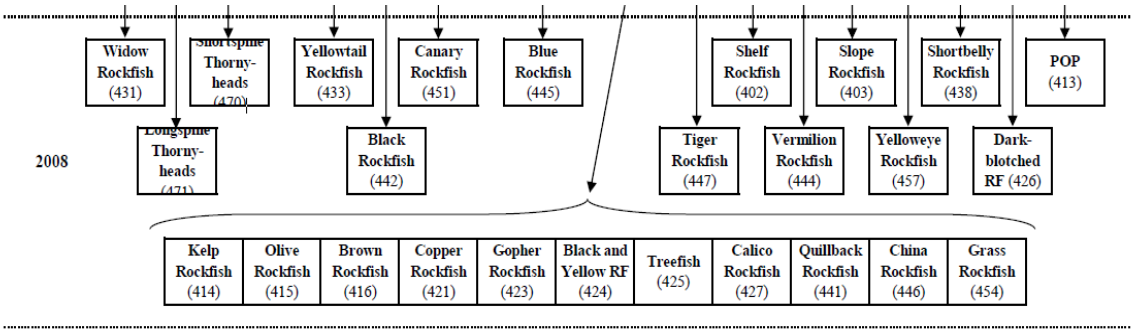

Figure 2. Recent market categories are now geared toward individual species

Results: Speciated URCK and POP1 landings

A total of 7,233 mt of Oregon URCK and POP1 rockfish landings were speciated in this reconstruction (Figure 3). As mentioned above, there were 8.8 mt that were caught with crab pots were not speciated.

The speciated URCK and POP1 landings comprise landings of 42 different rockfish species (Figure 4). This high level of species diversity was expected since ODFW's Other Rockfish (410) and Nominal POP (406) were multi-species "catch-all" market categories based on size rather than particular species.

In terms of total volume, canary rockfish was the main contributor to URCK and POP1 (Figure 4). However, canary rockfish landings within the URCK category sharply declined after a single-species canary rockfish market category was established in 1995, with the remainder of landings from URCK and POP1 thereafter due to sorting errors. The same situation occurred with black rockfish, of which landings declined after the establishment of a single-species black rockfish market category in 1994. The high landings of yellowtail rockfish in 1987 were unexpected since a single-species market category for yellowtail rockfish had been established in 1985. Upon inspection, these high yellowtail landings were caused by some poorly sorted landings that were sampled for species compositions, thus the high 1987 number appears reasonable.

Landings of individual rockfish species are compared in Figures 5-10 by: (1) PacFIN species estimates (e.g., yelloweye rockfish + nominal yelloweye rockfish); (2) the total reconstructed commercial landings (i.e., PacFIN species estimates + speciated URCK and POP1); and (3) the total Oregon commercial shoreside landings from the most recent stock assessment when available. Comparisons are shown for the rockfish stocks being assessed in 2017, plus canary rockfish (last assessed in 2015) since they were the main contributor to URCK and POP1.

As expected, relative differences were greatest for species that did not have their own market category at the time. For example, the reconstructed total commercial landings of Pacific ocean perch were very similar to the PacFIN species estimates since they had their own market category during the entire timeframe and thus rarely were being landed in the ODFW Other

Rockfish (410) and Nominal POP (406) market categories (of which nominal landings contribute to URCK and POP1, respectively).

Conversely, the reconstructed landings of species such as yelloweye rockfish that did not have their own market category were relatively higher since these species were landed into both of ODFW's multi-species categories and therefore remained nominal URCK and POP1 when species compositions were lacking. Finally, there were species such as canary rockfish that had their own category during part of the 1987-1999 era and consequently were landed in higher relative volumes during the earlier years prior to when they were given their own species specific market category.

Conclusion:

Although there is uncertainty with these speciated URCK and POP1 landings due to uneven levels of species composition sampling, we believe the landings to be reasonable estimations, given that fishermen using the same gear from the same ports generally were catching the same species albeit with some variation in species and contributions of species to overall category landings. For example, yelloweye rockfish were a consistent contributor in non-trawl species compositions for URCK in all ports. While the exact portion of URCK that is yelloweye rockfish is unknown, there is a high degree of certainty that yelloweye rockfish were a main contributor to URCK and without accounting for them, then the assessment would underestimate historical removals. Combined with species-specific queries to PacFIN, this reconstruction constitutes the best available set of commercial removals for rockfish species during this time period.

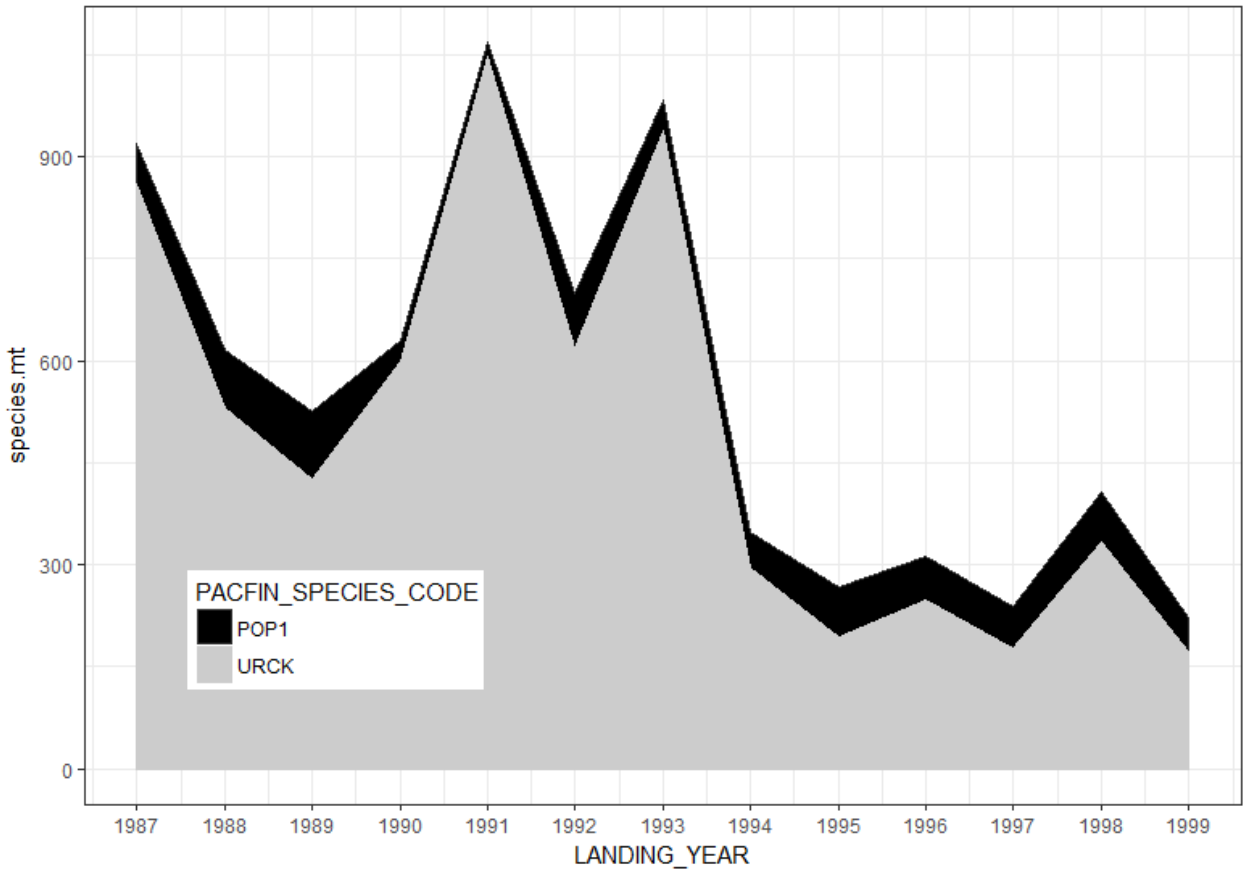

Figure 3. Unspecified commercial landings of URCK and POP1 in Oregon (1987-1999).

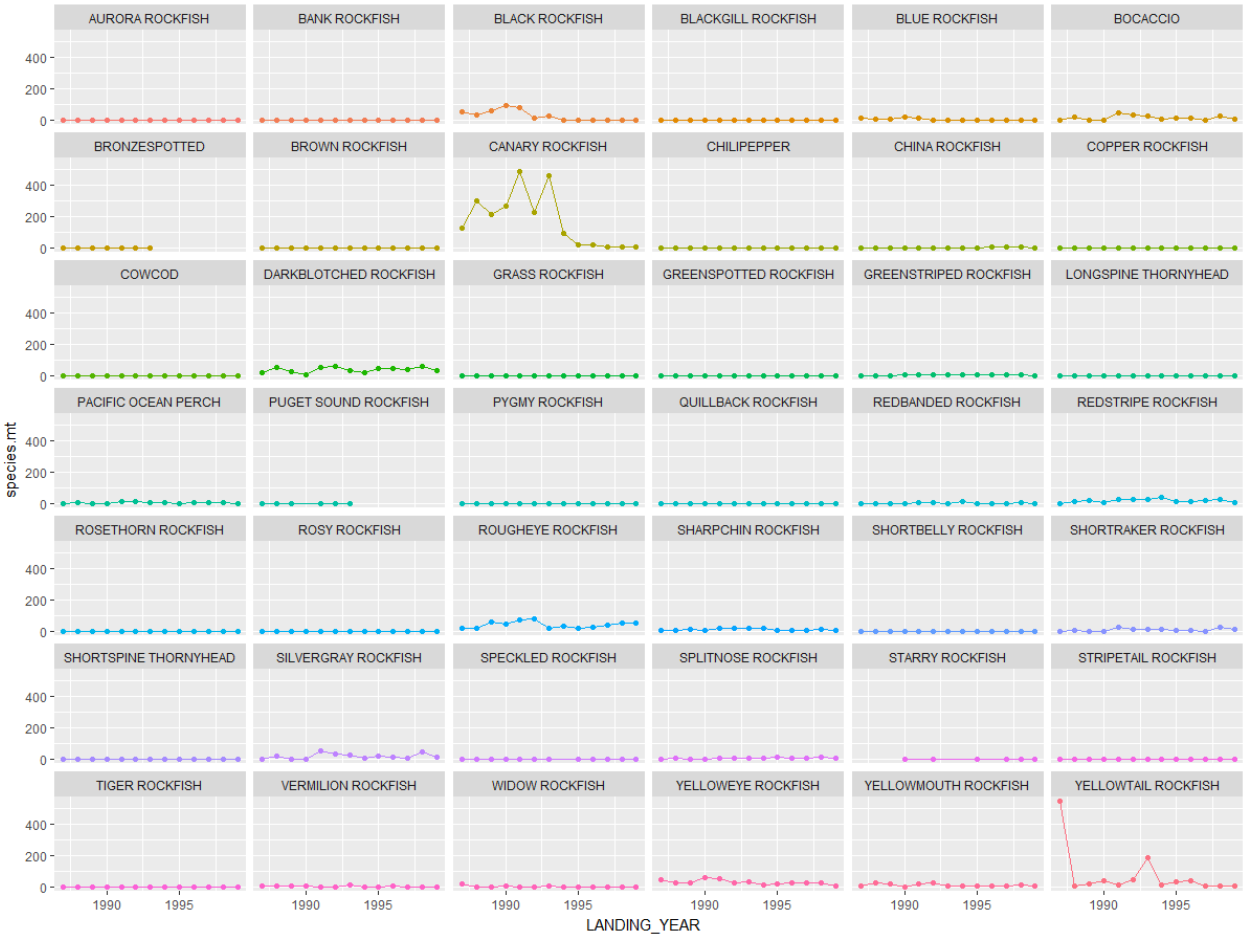

Figure 4. Speciated URCK and POP1 commercial landings from Oregon (1987-1999).

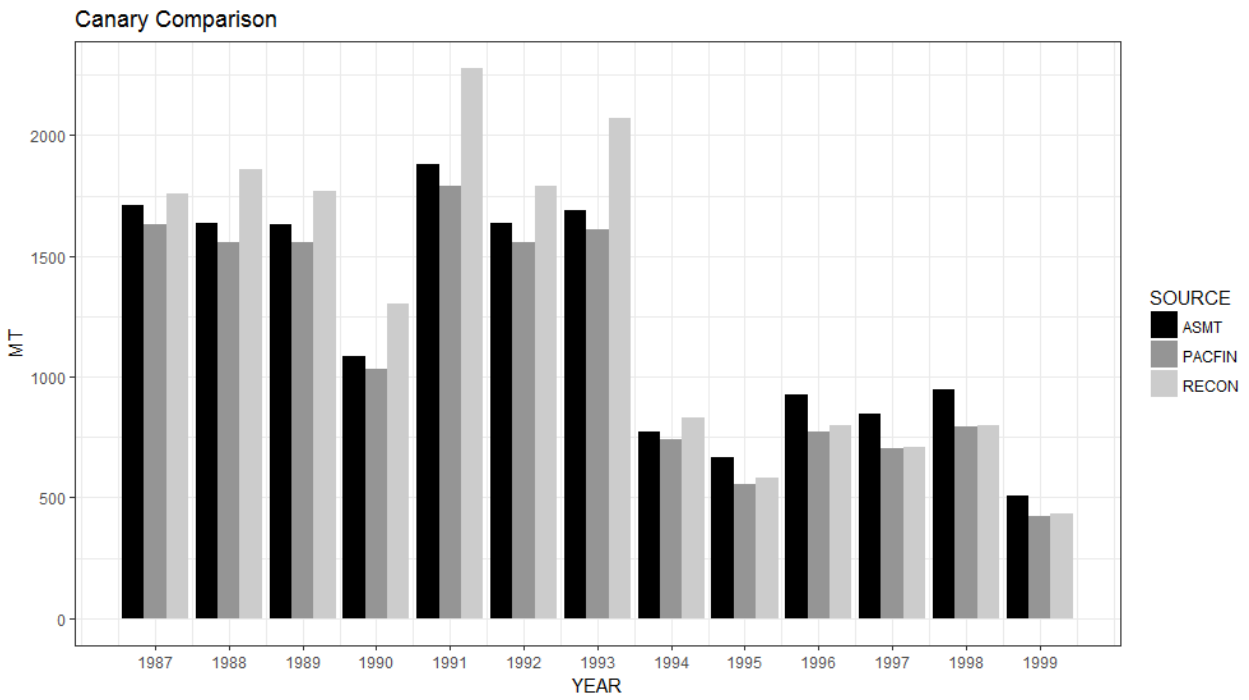

Figure 5. Comparison of Oregon commercial shoreside canary rockfish landings. "PacFIN" is the species estimate (including nominal) obtained from a PacFIN query; "Recon" is the total reconstructed estimate (i.e., "PacFIN" + speciated URCK and POP1 landings); "ASMT" is the total Oregon shoreside commercial landings when available.

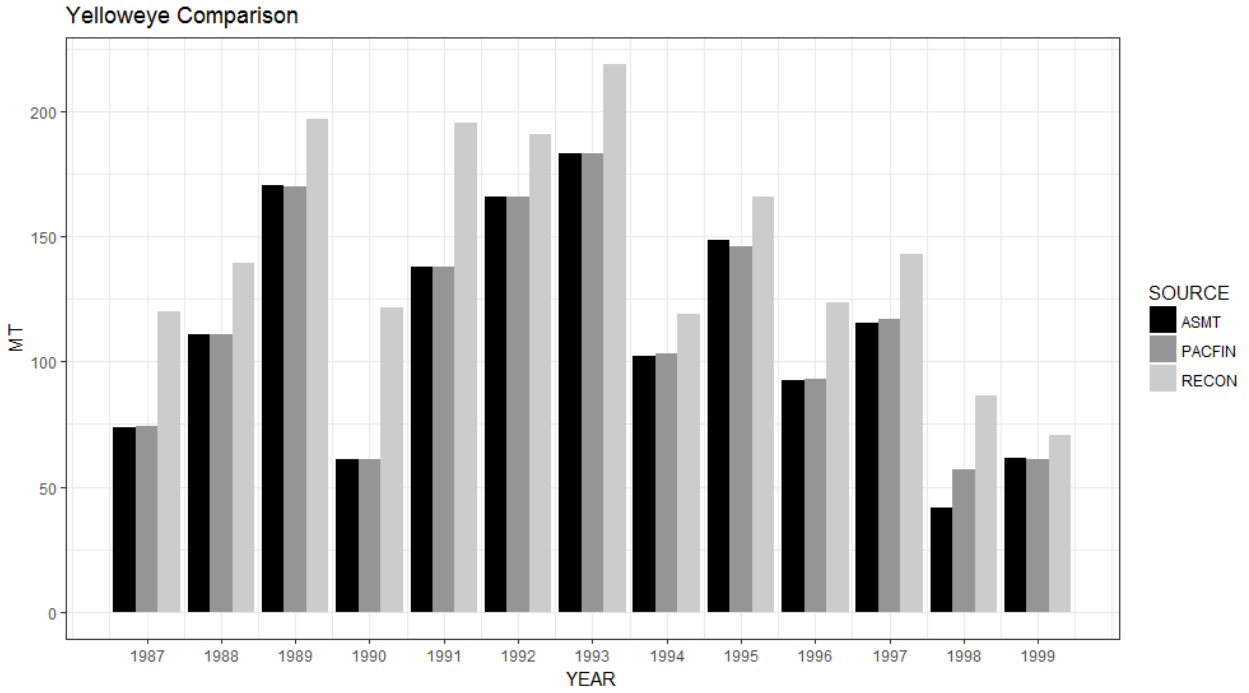

Figure 6. Comparison of Oregon commercial shoreside yelloweye rockfish landings. See Figure 5 for legend description.

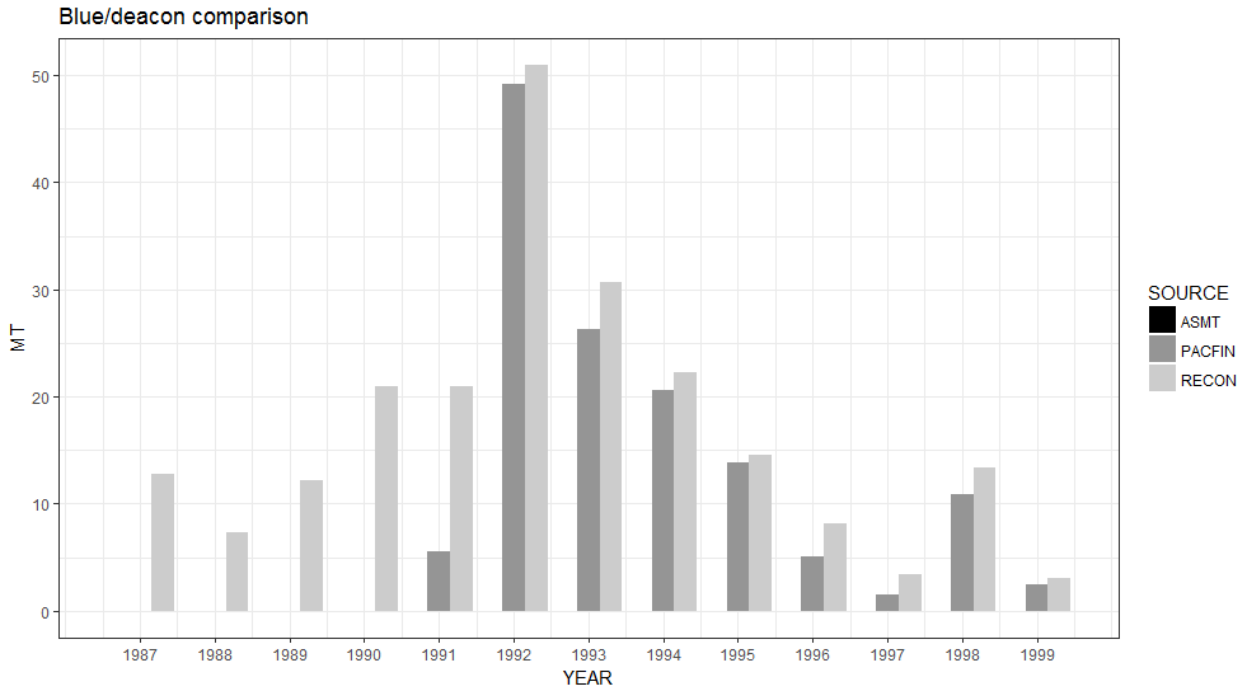

Figure 7. Comparison of Oregon commercial blue/deacon rockfish landings. See Figure 5 for legend description.

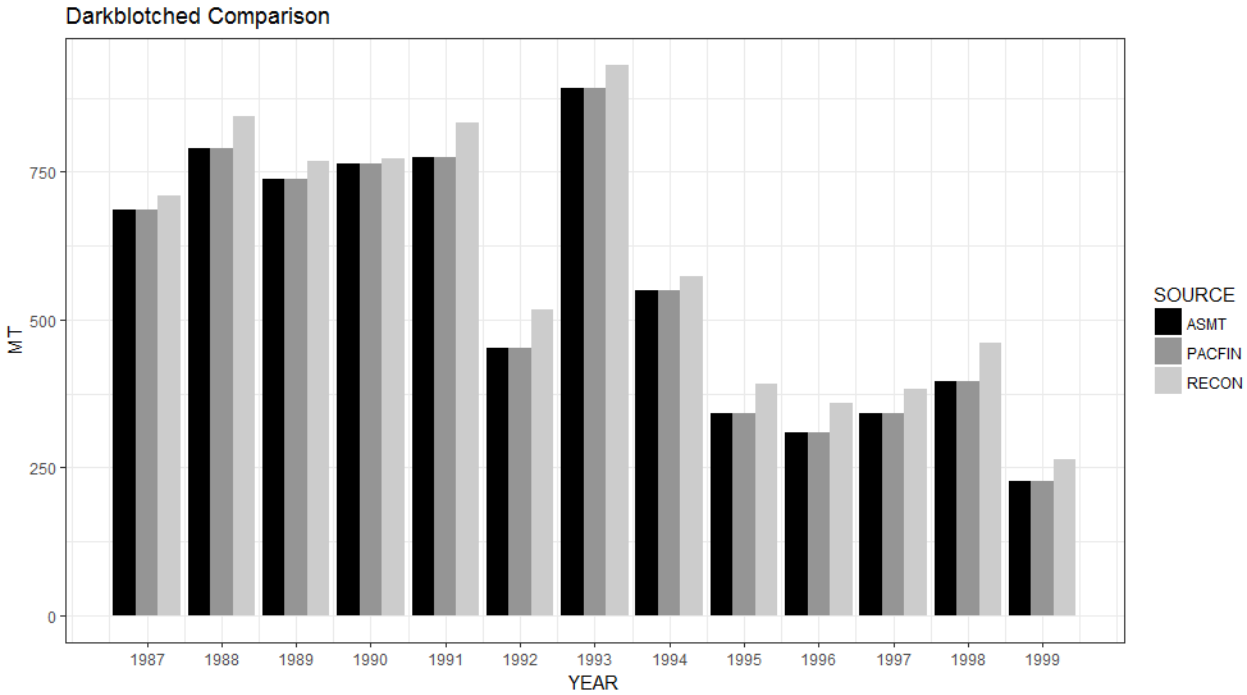

Figure 8. Comparison of Oregon commercial shoreside darkblotched rockfish landings. See Figure 5 for legend description.

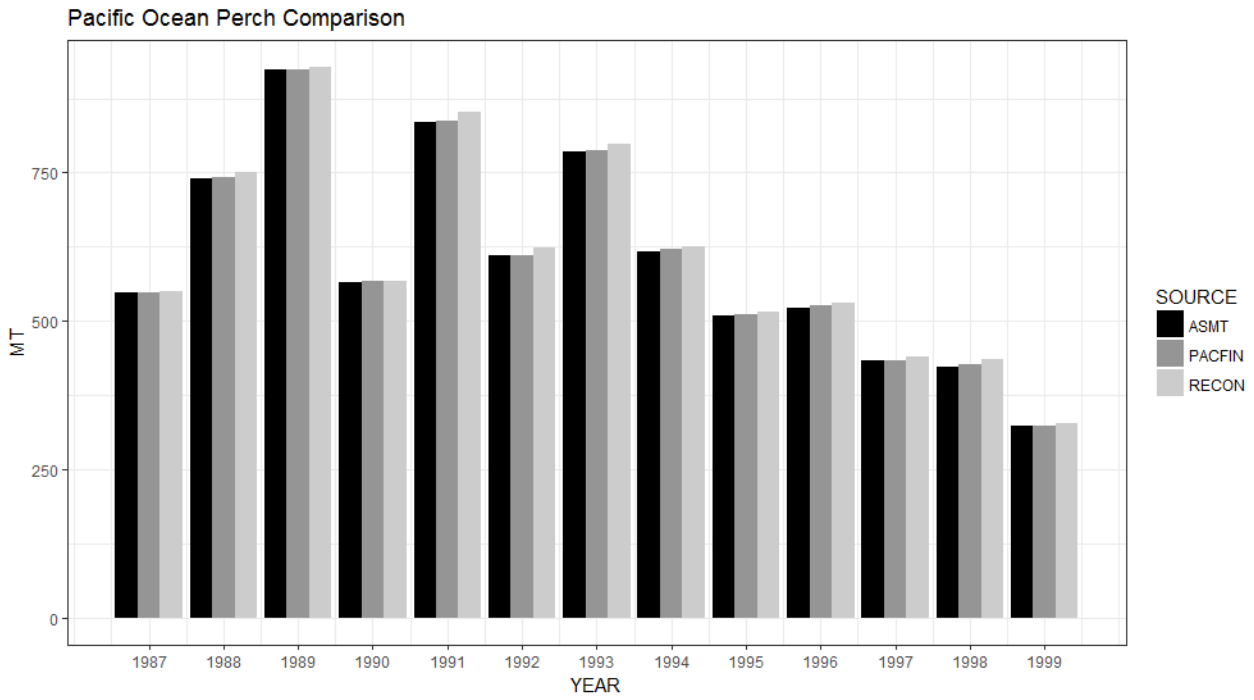

Figure 9. Comparison of Oregon commercial shoreside Pacific ocean perch landings. See Figure 5 for legend description.

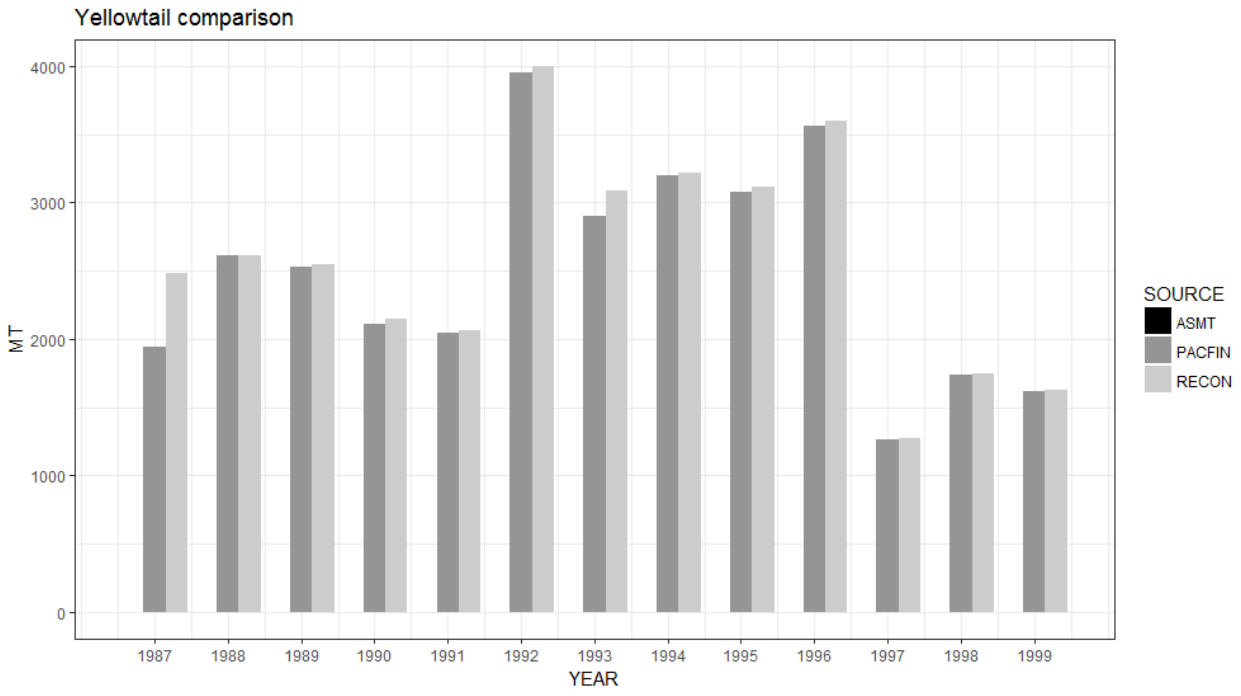

Figure 10. Comparison of Oregon commercial shoreside yellowtail rockfish landings. See Figure 5 for legend description.

References:

Karnowski, M, Gertseva, V., and A. Stephens. 2014. Historical Reconstruction of Oregon's Commercial Fisheries Landings. Oregon Department of Fish and Wildlife Information Report Number 2014-02.

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