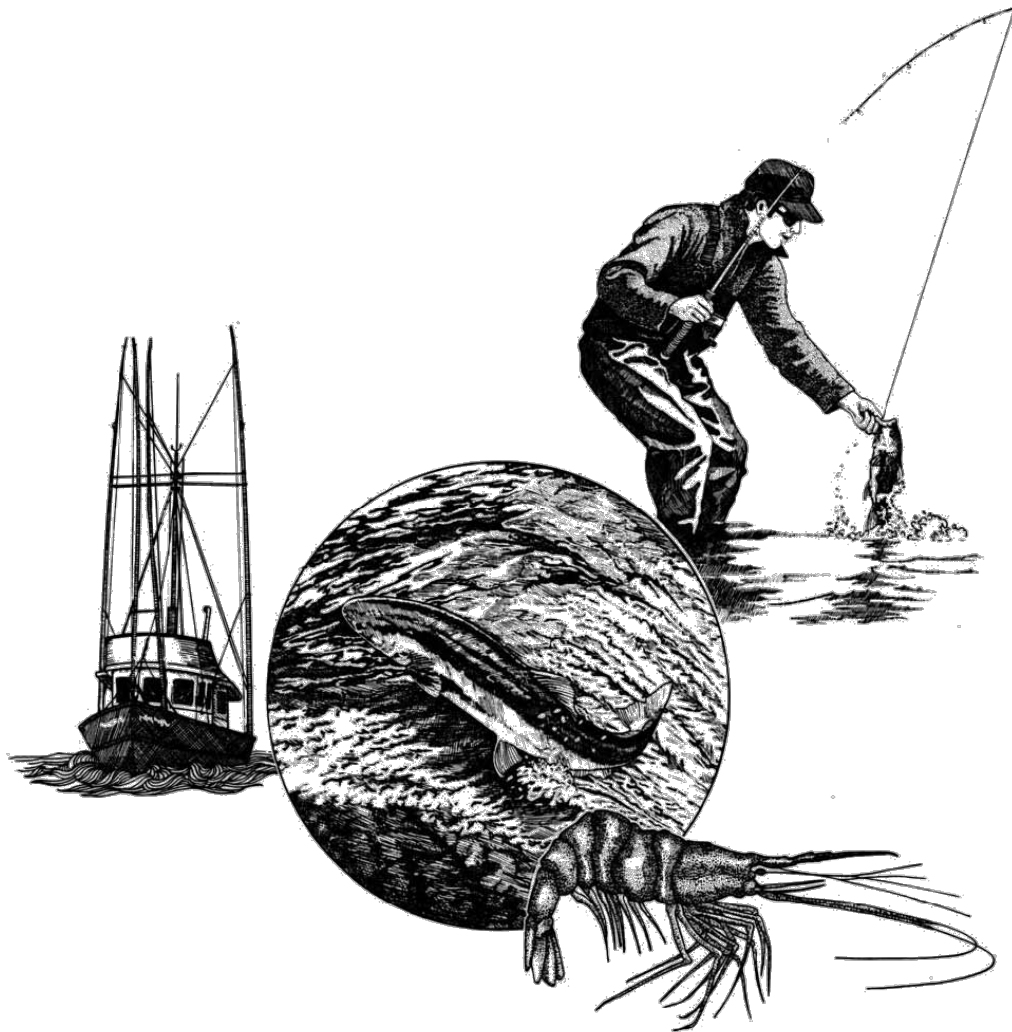


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Oregon Department of Fish and Wildlife

Historical Reconstruction of Oregon's Commercial Fisheries Landings

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HISTORICAL RECONSTRUCTION OF OREGON'S COMMERCIAL FISHERIES LANDINGS

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Acronyms used in this document

FSUS	Fisheries Statistics of the United States
INPFC	International North Pacific Fisheries Commission
MPDSR	Douglas, D.A. 1998. Species composition of rockfish in catches by Oregon trawlers, 1963-1993. Marine Program Data Series Report, Oregon Department of Fish and Wildlife
NMFS	National Marine Fisheries Service
NWFSC	Northwest Fisheries Science Center
OCL	Oregon Commercial Landings (Excel data file companion to this document)
ODFW	Oregon Department of Fish & Wildlife
OFGP	Reports of the Oregon State Board of Fish Commissioners or the Reports of the Fish and Game Protector
PacFIN	Pacific Fisheries Information Network
PFMC	Pacific Fishery Management Council
PV	ODFW Pounds & Values
RCS	ODFW raw composition samples
RecFIN	Recreational Fisheries Information Network
TSC	Reports of the Technical Sub-Committee of the International Trawl Fishery Committee

1. INTRODUCTION

Historical catch information is essential for fisheries stock assessment. Without knowing the catch history it is difficult to understand how a stock responds to exploitation (Hilborn and Walters 2003). On the West Coast of the United States, fisheries are managed by the Pacific Fishery Management Council (PFMC). Stock assessments for the groundfish species under the PFMC's purview are conducted every other year. Recent catch data (from 1981 on) for these assessments are available from the Pacific Fisheries Information Network (PacFIN), a regional fisheries database that manages fishery-dependent information in cooperation with National Marine Fisheries Service (NMFS) and West Coast state agencies. Prior to 1981, however, catch information is sparse, and there is no database analogous to PacFIN to handle the data. Historical reconstruction of catches prior to 1981 has been conducted by assessment authors for each assessment individually, and authors have often approached the problem differently, using different data sources and a variety of methods.

The PFMC recommended undertaking a coordinated reconstruction of West Coast groundfish landings to provide a comprehensive species-specific time series for use in stock assessments. The intent of this coordinated reconstruction is to improve the reliability of historical landings by identifying and drawing on preferred data sources, as well as applying a standardized method across all species. This should reduce duplication of effort and use of inconsistent assumptions by assessment authors in reconstructing catch, and expedite development and review of stock assessments in the future.

This document outlines the methodology we developed in a joint effort of the Oregon Department of Fish and Wildlife (ODFW) and the NMFS Northwest Fisheries Science Center (NWFSC) to reconstruct historical catches of species commercially landed in Oregon. The original goal was to focus on historical landings of groundfish alone; however the effort was expanded to include all species harvested commercially. The list of these species is provided in Table A1, Appendix A. We also revised species specific landings made within multi-species market categories during the first six years of the PacFIN era (1981-1986).

Reconstruction of the historical landings included several steps, in which we:

- 1) Determined the annual landings made within each market category, by gear;
- 2) Derived species compositions for each multi-species market category by gear, year and spatial stratum (where available);
- 3) Applied the year specific species compositions (from Step 2) to the historical landings in each multi-species market category (from Step 1) to obtain a species-specific time series of landings;
- 4) Summed the species-specific landings across market categories by gear to obtain a final time series of landings for individual species in Oregon.

This report is associated with a data file, called Oregon_commercial_landings_1889-1986_v1.0.xls (OCL), which is available from ODFW and NWFSC. The landings are reported in round pounds, which represent the whole-fish weight of the landed catch. Where historically landings were reported as dressed weights, those weights were converted to round pounds prior to incorporation into the file.

The reconstruction does not include estimates of recreational catches, foreign fleet landings, or discard associated with commercial harvest. We focused on the reconstruction of catch landed in Oregon. Fish

landed in Oregon, however, are not necessarily caught in state waters. Oregon vessels, particularly those from northern ports, such as Astoria/Warrenton, frequently fish in waters off of Washington, but return to Oregon to land their fish.

2. DATA SOURCES USED FOR THE RECONSTRUCTION

2.1. Market categories in Oregon

The definition of a market category in Oregon has changed over time. Originally, a category was based on market considerations and the value of fish caught. When there was a similar market value for all rockfish species, a general “Rockfish” category was used to represent the group for dealers and processors. As fishery management progressed, categories were created to reflect the need for species - specific catch information and not market value alone. For example, when a large fishery for widow rockfish quickly developed in the end of 1970s, a management need for more accurate catch data on this species appeared, and a new market category was implemented by regulation. Figure 1 illustrates the evolution of the rockfish market categories in Oregon since the 1880s.

Market categories may represent multi-species groups (such as the “Shelf/Slope Rockfish”) or be of a single species. Port biologists sample the species compositions of multi-species categories to determine the proportions of different species in a group; they also sort through single- species catch categories to verify the initial sorting of a species. Species compositions are sets of species proportions derived from sampling a category, that can be used to distribute the landed weight in that category among a group of individual species. Until a category has an associated species composition applied, it is considered “unknown” or a “nominal” category. For instance, the nominal “black rockfish” category may contain 95% of black rockfish and 5% of blue rockfish. Once species compositions are applied to a nominal category, the records represent the “true” landings of a species.

Prior to 1981 (pre-PacFIN era), rockfish in Oregon were landed in two mixed -species market categories (Fig. 1), including “Rockfish” (also known as “Other Rockfish” or “Unspecified Rockfish”) and “POP” (Pacific Ocean Perch). Unlike rockfish, major flatfish species have always been landed in separate market categories, since they historically have had different market values. A few minor flatfish though were landed together, in an “Other Flatfish” category. From 1942 to the early 1980s, a portion of flatfish and rockfish in Oregon were also landed in an “Animal Food” category (also called “Mink Food” or “Miscellaneous” by some sources). This portion of catch went to feed mink for the fur trade.

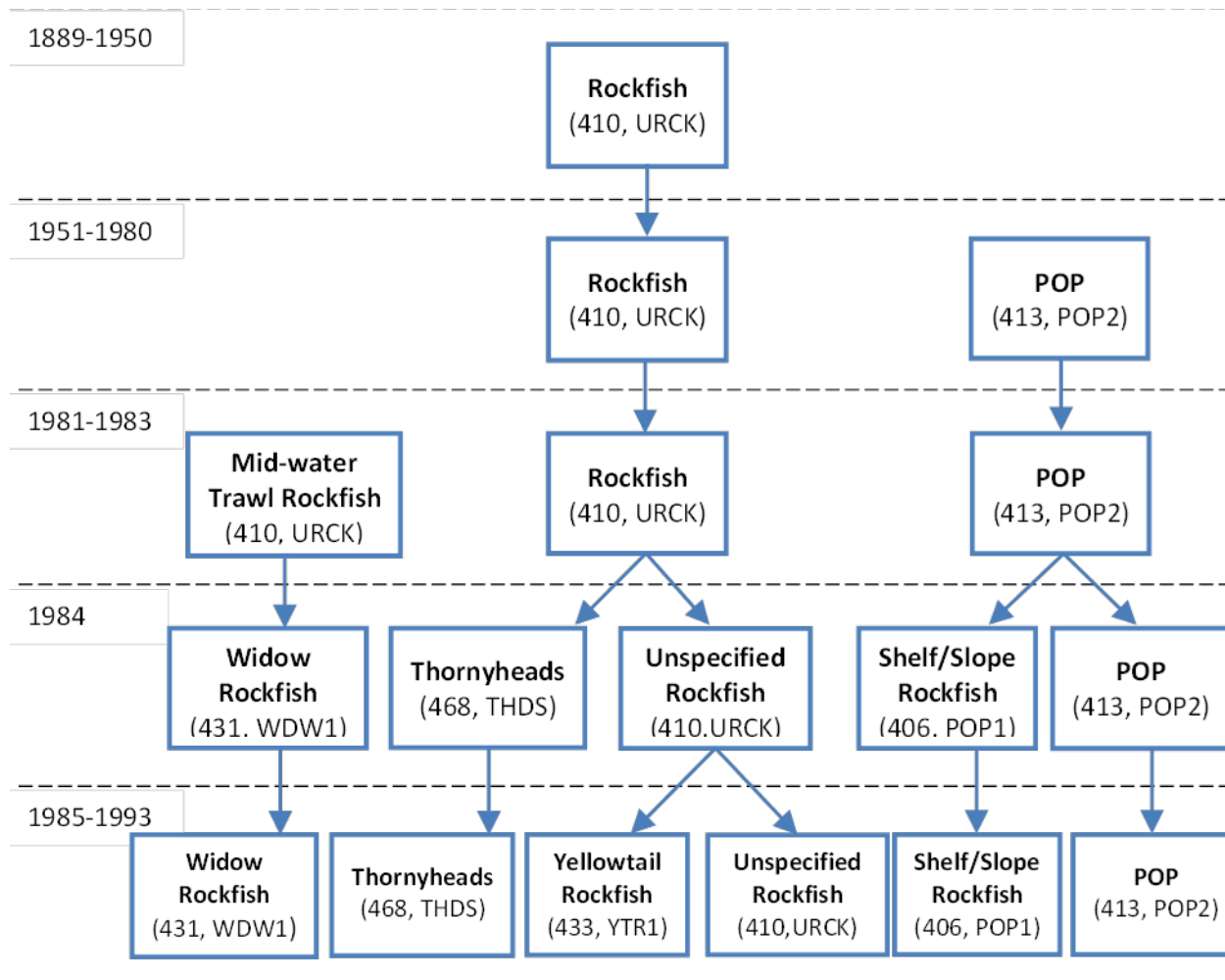


Figure 1. The evolution of ODFW Oregon’s rockfish market categories (1889-1993) with PacFIN market category codes in parentheses.

2.2. Sources of information on market category landings

There are a number of sources that summarize historical landings in Oregon. These sources differ in the amount of descriptive detail the data include. Generally, records of West Coast groundfish landings may include: year, month, season or quarter (depending on the sampling program) when landings were made, state or port (or port group) where landings were made, fishing gear or fishing strategy (for instance, live hook-and-line) used, and fishing area (for example, PFMC area or International North Pacific Fisheries Commission (INPFC) area). Our intention was to use the finest amount of detail available. However, many landings have incomplete descriptive documentation even in recent years, due to the complexity of the West Coast fishery and the limited sampling. From historical sources, only few observations of landings exist at other than highly aggregated levels, such as by state and year, with everything else combined.

The different data sources that were available for the reconstruction of Oregon historical landings are summarized in Table 1 and briefly described below. Temporal coverage of these sources is shown in

Figure 2. In many cases, there were competing sources for a given time period (Fig. 2). To identify the primary source (or sources) from which to build an entire time series of market category landings, top priority was given to original fish ticket data and fish ticket summaries compiled by state agencies. The reliability of other sources, such as annual state agency reports, summary statistics compiled from state reports, national statistics from the Fish & Wildlife Service or NMFS were judged by their consistencies with top priority sources, as these other sources may be several steps removed from the original data. State or federal statistics that lack sufficient references to identify the original source or those that are inconsistent with series listed above, as well as time series in non-scientific publications (National Fisherman, Pacific Fishermen, newspapers, etc.), were given a low priority.

The ODFW Pounds & Values (PV) was treated as the standard (the most reliable) data source for Oregon landings, and the reliability of other sources was judged by their consistency with the PV. PV is the ODFW product derived from the fish ticket electronic line data, summed every year to create standard PV summary reports. This source provides data from 1969 forward. The ODFW original fish ticket data for the period between 1969 and 1977, however, no longer exist, and only the summary reports are available for those years (Table 1). These summary reports, although provide total amounts landed within each market category by year, do not identify landings by gear.

The Fisheries Statistics of the United States (FSUS) are annual reports prepared by the NMFS that cover the period between 1927 and 1977. The NMFS conducted a series of statistical surveys as well as cooperated with state agencies to collect and compile data for these reports. Often the records on the volume of catch and operating units were obtained from the state fishery departments. When complete catch data were not available from the state agencies, NMFS statistical personnel (stationed in Seattle, WA and Terminal Island, CA) interviewed fishermen, wholesale dealers and manufacturers of fishery products. They also collected records from various fisheries organizations. The FSUS summarizes landings by year, state, district, market category and fishing gear. This source contains the longest time series for Oregon commercial landings (Fig. 2) and clearly distinguishes Columbia River and coastal district landings. It is also the only historical source that provides market category landings by specific gear type, including trawls, seines, pots, gill nets, lines and others.

Table 1. Summary of data sources available for historical Oregon landings. See page 2 for acronyms used for the data sources and areas. Gear abbreviations: T –trawl, N – non-trawl and C – all gears combined.

Source	Coverage	Fishing gear			Fishing area		Point of landings	
		<i>T</i>	<i>N</i>	<i>C</i>	<i>PFMC</i>	<i>INPFC</i>	<i>State</i>	<i>Port</i>
PV (fish ticket data available)	1978-Present	•	•	•			•	•
PV	1969-1977			•			•	
FSUS	1927-1977	•	•	•			•	
Cleaver (1951)	1928-1949			•			•	
Smith (1956)	1950-1953			•			•	
TSC	1942-1975	•					•	
Lynde (1986)	1956-1980			•	•			
“Big Book”	1956-1982	•			•	•		
OFGP	1889-1898			•			•	

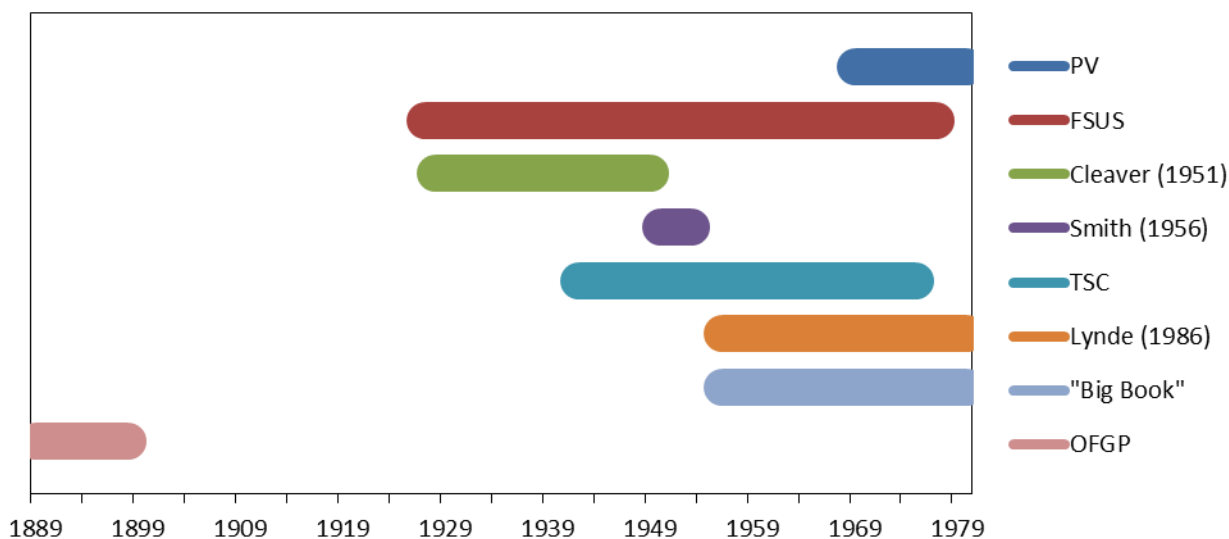


Figure 2. Temporal coverage of different data sources for hisrotical Oregon landings (see page 2 for acronyms used for the data sources).

The PV and FSUS overlap between 1969 and 1977 (Fig. 2), and the catch amounts reported in these two sources are nearly identical. Figure 3 illustrates consistency between PV and FSUS records of “Rockfish” and “POP” market category landings.

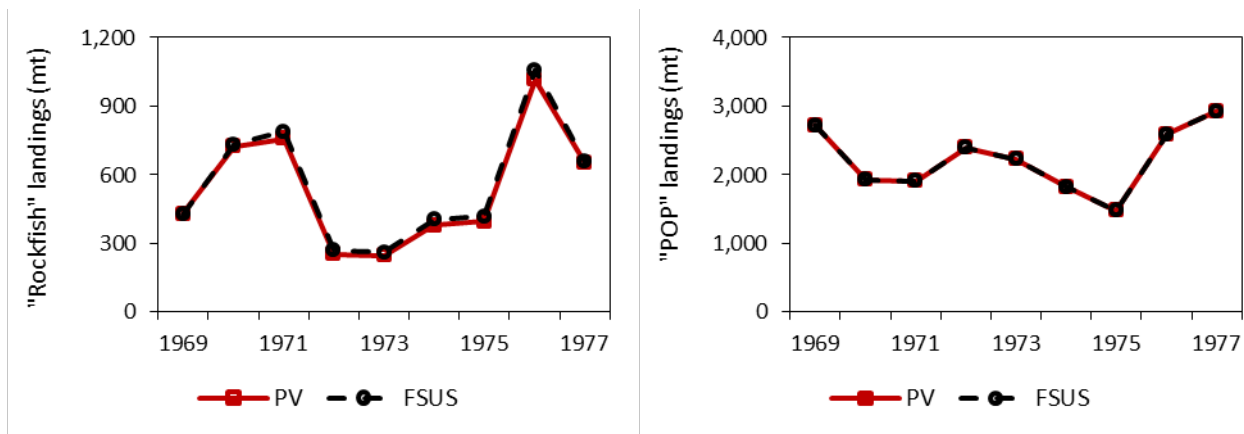


Figure 3. Comparison of landings reported in PV and FSUS for “Rockfish” (left panel) and “POP” (right panel).

Fisheries statistics of Oregon between 1928-1949 and 1950-1953 were also summarized by Cleaver (1951) and Smith (1956) respectively, but much of the reported landings in Cleaver (1951) originated from the FSUS, as noted in the Cleaver (1951) footnotes. The exact origin of Smith (1956) is not known but this source is also consistent with FSUS. Both Cleaver (1951) and Smith (1956) provided total landings (all gears combined) by year and market categories (Table 1).

The Technical Sub-Committee of the International Trawl Fishery Committee (TSC) regularly published reports that provided trawl landings by year, state and market categories. TSC data covered the period between 1942 and 1975. This source focused exclusively on trawl landings, and, therefore, its utility for the catch reconstruction was limited. However, it reported landings in the POP category separately from those in ROCKFISH starting in 1946 (FSUS started to separate these two categories in 1951). This source also reported “Animal Food” separately, while FSUS had “Animal Food” landings combined with those of flatfish. We used these additional details in the reconstruction.

Lynde (1986) compiled landings data (for all gear combined) between 1956 and 1980, into the Historical Annotated Landings (HAL) Database. This source reports landings by market category, year and fishing area (PFMC and INPFC areas). The records from which Lynde (1986) numbers were taken provided landings broken down into fishing areas, based on fishermen interviews, and did not include the data on state of landings. The exact methods used to convert state landings into fishing area were not documented. Therefore, it was problematic to convert Lynde (1986) data back to the state landings and use them for the reconstruction.

The same was true of the “Big Book”, the Pacific Marine Fisheries Commission data series. The “Big Book” reports trawl landings of market categories by fishing area, but does not include state of landings, and it is not clear how the state level data were converted to fishing area catch. The “Big Book”, however, contains information on landings by month (in addition to year). These data may be valuable as modeling tools and management needs evolve to create monthly or seasonal time series in the future.

A few earlier landings records were recently discovered, including the Reports of the State Board of Fish Commissioners and the Reports of the Fish and Game Protector (OFGP). These records provide

landings by market category and year, and together cover the period between 1889 and 1898. They were used to inform Oregon landings in early years.

2.3. Sources of information on individual species landings from market categories

The ODFW has routinely sampled species compositions of multi-species rockfish categories from commercial bottom trawl landings since 1963. These species composition samples were assigned to a specific PFMC area and depth based on logbook information and interviews with fishermen. They were then expanded to trawl landings from a corresponding spatial stratum (defined by PFMC area and depth) so that the annual species compositions calculated would account for differences in landings among spatial strata. The landings values used for the expansion were obtained from the TSC reports. For the expansion, proportions of sampled catch in different spatial strata were used to break down the annual catch by PFMC area and depth and derive species' estimated stratum-specific landings (Douglas, ODFW, pers. com.).

The time series of estimated species specific Oregon landings of rockfish have been published in several ODFW reports, including Niska (1976), Barss and Niska (1978) and Douglas (1998). The last publication, the Marine Program's data series report (MPDSR), entitled "Species composition of rockfish in catches by Oregon trawlers, 1963-1993", by Douglas (1998), was an expansion and improvement on the earlier publications. The actual individual composition samples were not available electronically (except for a few years), but the MPDSR provides Oregon trawl landings of multi-species rockfish categories by species, PFMC area and depth, estimated as described above.

Three data sources were available to inform contribution of different species to the "Animal Food" market category. These sources included Jones and Harry (1961), Niska (1969) and Demory (1974). Jones and Harry (1961) reported species composition of "Animal Food" for 1953-1956, Niska (1969) for 1958-1965, and Demory (1974) for 1974. The data in these three sources were reported differently so various approaches were used for creating species compositions for different time periods.

Commercial landings of groundfish species with gear types other than trawl have been traditionally low. The sampling of species composition of these non-trawl landings was also minimal yielding inadequate sample sizes. Consequently, for most of the historical period, information on year and gear specific species compositions for non-trawl landings was unavailable. Consistent sampling of non-trawl landings for species compositions began in 1985, and sampling efforts have increased gradually over the years. These more recent species composition samples were used to inform historical non-trawl landings. However, since market categories have changed over time, with historical market categories being split into finer groups (Fig. 1), more recent species composition samples from the relevant categories (weighted by the amount of catch landed by different gear types) were combined to represent the species included in historical categories.

3. METHODS TO RECONSTRUCT MARKET CATEGORY LANDINGS

3.1. 1889-1926

The records of landings in Oregon began in 1889 with the Reports of the State Board of Fish Commissioners, Series 1-6 (OFGP), followed by the Reports of the Fish and Game Protector, Series 1-6 (OFGP). Together, these sources inform about Oregon landings between 1889 and 1898. Both

summarized fishing activity yearly from December 1 of the previous year to November 31 of the reported year; these were used as calendar years and were not adjusted. The accuracy of the landings information in these series is not known. The reports mention that it was difficult to acquire data because some fish dealers were refusing to give information on the amount of fish processed (Reed 1891, Reed 1892).

These reports described the beginnings of many of Oregon's fisheries. The salmon fisheries had been in place before 1889, although the Sturgeon, Shad, and Smelt fisheries had just begun (Reed 1891). In 1889, the ocean fisheries had also just started.

“Our salt-water fishing has been started the past season by the Deep Sea Fishing Company, of Portland, under the management of Mr. Luther Maddock, who is well versed in that kind of fishing, having been reared in it on the coast of Maine. He has made a success of the enterprise this season, and has concluded to make Oregon his home and deep-sea fishing off its shores his business, and we can look for great developments in this industry in the near future.” (Reed 1891)

In 1890, the ocean fisheries were “still carried on by the Pacific Deep Sea Fishing Company of Portland, and with very good success. Though they employ but one vessel as yet, we have been assured by them that they do not intend that the demand shall ever be greater than the supply” (Reed 1891).

During these early years, there were very few fishers engaged in ocean fishing; in 1892 there were only four men ocean fishing out of the Coquille River and six men from Coos Bay with two additional men digging clams (Reed 1891). By 1896,

“Cultus cod, groupers, and other deep sea fish are found in great abundance in the ocean just off the mouth of the bay. The fresh fish trade of Yaquina for the past year is shown in the following table, the greater portion of which was sold in Albany, Salem, and other valley towns.” and out of the Coquille Bay, “The fishermen also take large quantities of cultus cod, rockfish and halibut, which is sold fresh or shipped to San Francisco.” (McGuire 1896).

The Portland Deep-sea Fishing Company is also mentioned several times in Lewis & Dryden's Marine History of the Pacific Northwest (Wright 1895), although early ocean fishing was not described as optimistically as in the OFGP reports. The steamer *George H. Chance* was built at Yaquina for this fishing company, which made several successful trips to the halibut banks but the fishing business proved unprofitable. In 1886, another boat owned by this company, the schooner *Carrie B. Lake*, ran aground near Portland and the boat and crew were lost. These early data sources show early ocean fishing to be unprofitable. Ocean caught landings during this time appear to be minimal, with the majority comprising Pacific Halibut caught with longline gear.

The OFGP makes no mention of weights being recorded as dressed weights, so all are considered to be round weights. The names of a few market categories from OFGP were adjusted in OCL file for consistency with other sources. Specifically, the category “Clams, Soft” from the OFGP was changed to

“Clams, Mixed”, because in the FSUS “Clams, Mixed” was used in most years, and “Clams, Soft” was reported only in 1929-1931, instead of “Clams, Mixed”. The “Clams, Mixed” were further separated into “Clams, Razor” and “Clams, Mixed” by applying a ratio of razor clams to mixed clams estimated from 1927-31 FSUS records, so that interpolation with later data was possible.

A few categories in OFGP appear to have been inconsistently reported, possibly due to the difficulty in obtaining accurate landings information from dealers during these years. For categories with missing records, landed catch was linearly interpolated between years when landings were reported (Table B1). The 1893-1894 OFGP reported Oregon landings, but the table with landed catch was not labeled as to what year it summarized, so we used 1893-1894 OFGP records for both 1893 and 1894 (Table B1).

Ocean landings data were not available in the period from 1899 to 1926 in Oregon Fish and Wildlife reports, as they became more focused on salmon and economic data such as production and expenditures. In the historical reconstruction, we linearly interpolated the data from 1898 to 1927; with the exception of a few categories. “Catfish” appears in early reports, however in the early 1900’s, Oregon enacted a law to define catfish as a sport fish and commercial landings were no longer allowed. We did not interpolate landings for “Striped bass”, since the fishery for this species began in the late 1920’s (Mogan 1950). The “Surfperch” category was not interpolated, as the 1927 FSUS did not report this category, although there may have been landings within this period.

Unfortunately, not all Salmon landings were included in this time period because processed, fresh, and smoked salmon were reported separately, and because Oregon’s Columbia River landings were combined with Washington’s (McGuire 1896). Salmon landings records begin in 1927 with the reported values in the FSUS.

3.2. 1927-1968

The Fisheries Statistics of the United States (FSUS) were used as the basis for 1927-1968 annual landings by gear (trawl and non-trawl). The Fishery Statistics of Oregon (Cleaver 1951) is often cited for Oregon landings. Much of the reported landings in Cleaver (1951), however, originated from the FSUS, as noted in the landings table footnotes in Cleaver (1951). These footnotes also state that rockfish and sablefish landings are for dressed fish. The corresponding FSUS landings are much higher and presumably were converted to round pounds. Soupfin and Spiny Dogfish sharks were also reported in dressed pounds in Cleaver, while the FSUS appears to report a converted round weight.

Where not already reported in round weights, we converted the landings in the FSUS to round weights. The 1941 FSUS report contained the following note:

“Prior to 1941 the poundage of halibut, sablefish, lingcod and rockfishes reported represented the dressed weight of the fish landed. Beginning with the data for 1941, all catch statistics are shown in round weights. When the following species have been landed dressed, the poundage has been converted to round weight by multiplying the following factors: halibut, by 1.33; lingcod, rockfishes, and sablefish, by 1.43.”

We applied these conversion factors to the landings of the specified groups between 1927 and 1940. Clams, mussels, and oysters were also converted to round weights; the conversion factors we used were

from the FSUS and are given in Table B2. There were no conversion factors given for landings between 1927 and 1938, so we used the 1941 factors for conversion in those years.

We adjusted the names of some of the categories in the FSUS to make them comparable with other sources. Both “Grayfish” and “Shark, Grayfish” were changed to “Shark, Spiny Dogfish”; “Clams, Soft” in 1929-1931 were re-named to “Clams, Mixed”, since no “Clams, Mixed” in 1929-1931 were reported; “Crabs” were re-named to “Crabs, Dungeness” since only one category or the other was used in a particular year. Other minor naming changes are shown in Table B3.

Landings of the multi-species market categories between 1927 and 1968 were reconstructed as described below.

3.2.1. “Rockfish” 1927-1968

The “Rockfish” category landings for the period between 1927 and 1968 were taken from FSUS. This source is consistent with PV (Fig. 3), the preferred data source for Oregon landings. It is also consistent with other historical sources of “Rockfish” landings, such as Fisheries Statistics of Oregon by Cleaver (1951) and by Smith (1956) (Figure 4), which is not surprising given that Cleaver (1951) records originated from the FSUS.

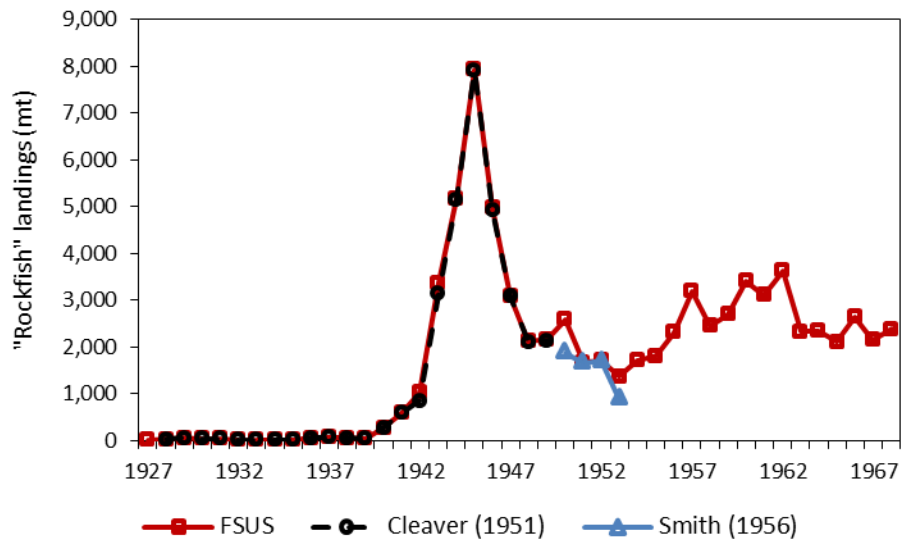


Figure 4. “Rockfish” landings reported by different sources.

3.2.2. “POP” 1946-1968

The fishery for Pacific ocean perch developed from Oregon to British Columbia in the late 1940s, and the “POP” (Pacific Ocean Perch) market category in Oregon appeared in 1951 (Fig. 1). Although the majority of “POP” landings were Pacific ocean perch, this market category included a number of other rockfish species, especially those similar in appearance to Pacific ocean perch.

The historical POP landings are reported in FSUS, TSC and Smith (1956). All sources were found to be fairly consistent with one another (Figure 5). We used the FSUS as the basis for “POP” landings for

most of the time period. FSUS, however, did not separate “POP” from other rockfish until 1951 (when the “POP” market category appeared); prior to 1951 “POP” landings were reported within “Rockfish” category. The TSC, on the other hand, provided records of “POP” landings starting from 1946. To apportion the pre-1951 “Rockfish” catches in FSUS into “Rockfish” and “POP”, we calculated the “POP” to “Rockfish” ratios by year from the TSC data, and then used those year specific ratios to separate “POP” from “Rockfish” in the FSUS, for the period between 1946 and 1950.

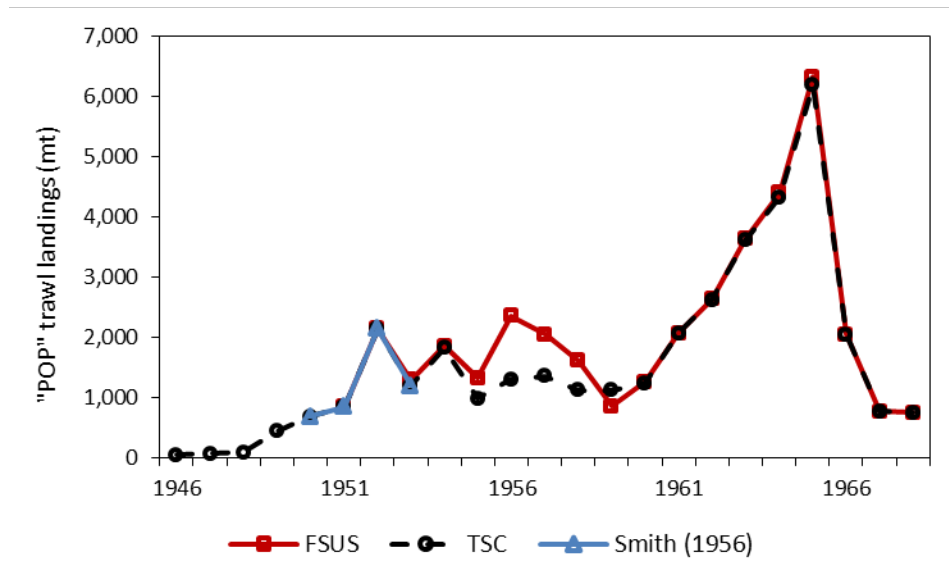


Figure 5. POP landings reported by different sources.

3.2.3. Flatfish 1927-1968

The FSUS was used as the basis for flatfish trawl landings between 1927 and 1968. The individual market categories of flatfish in the FSUS were combined into “Flounder, Sole” or “Flounder, Other”. TSC, on the other hand, reported many flatfish by species for the most part of the historical period (since 1942). These species included English, Dover, Petrale, Rock and Rex soles as well as Starry flounder; other minor flatfish were combined into an “Other Flatfish” category. The TSC only reported trawl landings, but the vast majority of flatfish were historically landed by trawl gear. We calculated proportions of different flatfish species from the TSC by year and then applied these proportions to the FSUS flatfish trawl landings.

3.2.4. “Animal Food” 1942-1968

From 1942 to the early 1980s, a portion of the landings of flatfish and rockfish fish went to feed mink for the fur trade. Mink food consisted mainly of red meat until World War II, when horsemeat became increasingly difficult and expensive to obtain (Niska 1969). During this period, there was an abundance of fillet carcasses, which were used as a protein source for mink. When the demand exceeded the supply, whole fish were specifically targeted to supplement the carcasses (Niska 1969).

Several sources provided records of “Animal Food” landings, including TSC, Niska (1969), Jones and Harry (1961) and Harry (1956). These sources were found to be consistent with one another (Figure 6),

except for Harry (1956), whose estimates were derived from interviewing mink ranchers and were higher than landings reported in TSC for the same time period.

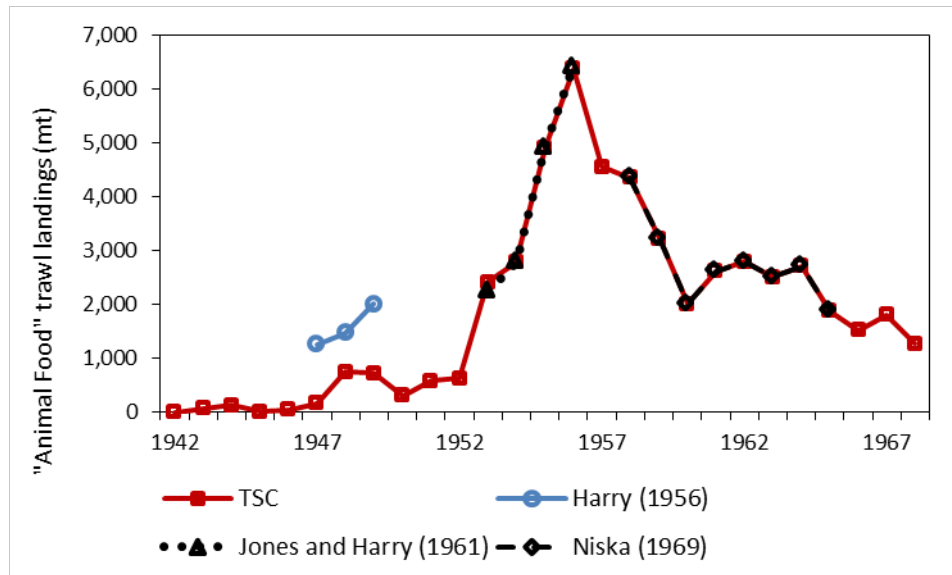


Figure 6. "Animal Food" landings reported by different sources.

The "Animal Food" in the FSUS was reported within the "Flounder, Sole" category. The TSC reported the amount of "Animal Food" from the trawl caught fish. All flatfish groups listed in the TSC were combined and year specific proportions of the "Animal Food" within the total flatfish were calculated. These proportions were applied to the combined "Flounder, Sole" and "Flounder, Other" landings in FSUS and then the estimated amounts of "Animal Food" were subtracted from the "Flounder, Sole" category of the FSUS by year between 1942 and 1968.

3.3. 1969-1977

Since 1969, ODFW began producing ODFW Pounds & Values (PV) reports based on the original fish ticket data. For the period between 1969 and 1977, however, the original fish ticket information no longer exists, and only PV summary reports are available. These reports contain limited amount of information and do not apportion landings by gear. For the 1969-1977 period, the PV and FSUS overlap, and in most categories, values from the two sources are identical (Fig. 3). For these categories, PV summary reports were used to inform total landings, but FSUS was used to apportion these total landings to gear by applying FSUS year specific ratios of trawl to non-trawl landings to PV records.

The records in two sources did not always equate for groups that were commonly landed dressed, and must have been converted to round. For instance, the skate landings in the PV during certain years appear unrealistic. For example, in 1971 only 707 pounds were reported in the PV, while the FSUS reported 25,500 pounds. Where the FSUS and PV disagree, we used the FSUS and assumed that a conversion to round weights had been applied to the values reported in the FSUS. Towards the end of this time period, the values reported in the PV were apparently also converted to round.

Some categories were better discriminated in the FSUS, but combined into a larger category in the PV. These include the PV categories “Herring”, “Clams, Bay”, “Other Tuna”, “Smelt”, and “Oysters”. The FSUS reports sardine and herring as individual categories, while the PV includes them both in “Herring”. The sum of the separate categories in FSUS matches those in the PV, so the more detailed FSUS information was used.

The “Clams, Mixed” and “Clams, Razor” categories were listed separately in the FSUS, but were combined into “Clams, Bay” in the PV until 1975 (in 1975 PV began reporting these categories separately as well). Clams in FSUS were reported dressed. When the FSUS clams were converted to round pounds (using conversion factors reported in FSUS), the total amount of clam landed were very close to the one reported in the PV (Table 2).

Table 2. A comparison of FSUS and PV data sources for the clam market categories between 1969 and 1972.

Year	FSUS Category	FSUS rounds lbs.	PV Category	PV round lbs.
1969	Clams, Razor 2	25,238	Clams, Bay	47,125
	Clams, Mixed 3	21,905		
	Total Clams	47,143		
1970	Clams, Razor 2	14,762	Clams, Bay	40,690
	Clams, Mixed 3	26,190		
	Total Clams	40,952		
1971	Clams, Hard, Butter 1	400	Clams, Bay	58,753
	Clams, Hard, Littleneck 1	800		
	Clams, Razor 2	30,000		
	Clams, Mixed 1	28,000		
	Total Clams	59,200		
1972	Clams, Cockle 1	10,800	Clams, Bay	74,130
	Clams, Hard, Littleneck 1	1,600		
	Clams, Razor 2	12,857		
	Clams, Mixed 1	49,600		
	Total Clams	74,857		

For the reconstruction, PV clam catches were used; we calculated the ratio of razor clams to mixed clams in the FSUS, and applied that ratio to the mixed “Clams, Bay” values in the PV. The landings of clams in FSUS and PV were nearly identical for in all years except for 1976 and 1977; it is unknown why clam records in those two years were different between sources. We used the FSUS values for the “Clams, Razor” and “Clams, Mixed” for 1976 and 1977.

There were a few categories that were listed in the FSUS but they do not appear in the PV. In 1970, “Tomcod” was listed in the FSUS but not in the PV. This might have been due to the omission of tomcod from the landings report form. In 1971, “White Sea Bass” was recorded in the FSUS but there has never been a category for this group in the PV. In instances like these, we used the FSUS data and included them in the OCL file.

The PV reports during this period have footnotes that “Animal Food” category included mink food, scrap, miscellaneous cod, carp, and brine shrimp. There were no species composition samples collected from the “Animal Food” category during this period. Lacking necessary information, we did not try to separate the present day categories of carp and brine shrimp from “Animal Food” before applying species compositions to these data.

3.4. 1978-1986

The FSUS data series stopped in 1977. Since 1978, however, the original fish ticket data are available – these are the data that are used to generate ODFW PV reports. These original electronic fish ticket line data were used to reconstruct annual landings of market category by gear for the period between 1978 and 1986.

There has been some confusion over values for widow rockfish reported in the PV (Table 3). The mid-water trawl fishery for widow rockfish developed in the late 1970s. In 1981 and 1982, widow rockfish landings caught with the mid-water trawl gear were separated by the port biologists from catches made by other gears into unique tickets based on vessel logbook hail data, and entered into the electronic fish ticket system as the “widow rockfish” category. In 1983, widow rockfish were reported in the PV as “mid-water caught unspecified rockfish”, the category mainly comprised of widow rockfish. The “Rockfish, Widow” market category was officially created in 1984. In the OCL file, we used “mid-water caught unspecified rockfish” instead of “widow rockfish” for 1981 and 1982 to be consistent with 1983 records. A further change was made to the widow landings for 1979. Species composition samples collected in 1979 included those from the mid-water trawl caught rockfish category, but the landings information did not separate mid-water and bottom trawl catches. We calculated the ratio of mid-water to bottom trawl caught rockfish in 1980, and applied it to the 1979 catches to estimate widow rockfish landings in 1979.

Table 3. Commercial rockfish landings from the ODFW Pounds & Values Reports (PV) for the period of 1978-1986. In 1983, widow rockfish landings included in “Rockfish, other sp.” as “mid-water caught unspecified rockfish”.

	1978	1979	1980	1981	1982	1983	1984	1985	1986
Pacific Ocean perch	1,934,061	4,193,424	3,614,994	4,350,997	5,508,130	5,192,175	1,576,824	1,554,767	1,385,049
Nominal POP							1,472,712	2,378,182	2,093,576
Rockfish, widow				31,768,970	19,198,987		11,635,817	9,535,857	9,435,395
Rockfish, yellowtail								2,985,880	3,667,900
Rockfish, other sp	11,559,767	19,194,651	35,201,051	18,321,262	22,031,780	30,291,426	12,231,908	10,033,146	7,912,485
Thornyhead sp							1,785,270	2,361,759	1,399,250

4. METHODS TO RECONSTRUCT INDIVIDUAL SPECIAL LANDINGS FROM MARKET CATEGORIES

Prior to 1981, rockfish landings in Oregon were reported within “Rockfish” and “POP” multi-species market categories. A few flatfish species were landed together in “Other Flatfish” category. Also, a portion of rockfish and flatfish were landed within “Animal Food”. We reconstructed species specific landings within each of these multi-species categories. A detailed description of the methods used to derive per species estimated landings for different time periods and gear types is given below. We also provide tables with summaries of methods used to reconstruct landings and species composition of each of the multi-species categories (Tables 6-9).

4.1. “Rockfish” and “POP”

4.1.1. Trawl Landings

4.1.1.1. *1889-1926*

Bottom trawl technology was not fully developed until the late 1930s (Love et al. 2002), and, therefore, all landings between 1898 and 1926 were assumed to be made by non-trawl gear types.

4.1.1.2. *1927-1977*

During this time period, majority of “Rockfish” and “POP” catches were landed by trawl gear. We used MPDSR (see Section 2.2 for details on this data source) to derive annual proportions of different rockfish species within the “Rockfish” and “POP” landings between 1927 and 1977. The MPDSR provided species composition by year along with PFMC area and depth of catch (between 1963 and 1993) most of the times (based on logbook data and interviews with fishermen). However, there were a few occasions when MPDSR reported landed catch of a market category without attributing this catch to species and depth strata (simply providing market category total by PFMC area). To estimate proportions of different species in areas for which species compositions were not available, we used the proportions of species from an adjacent PFMC area in the same year, assuming the same distribution of species by depth. When species compositions from two adjacent areas were available, we used the average of the two for the area lacking composition information. We then applied proportions assumed for an area with no species composition data to the catch for that area and year (reported in MPDSR), converting the species proportions to weights.

In the MPDSR, proportions of different species sampled were applied to time series of landings (by market category) reported by TSC to estimate annual per-species amounts landed. In the reconstruction, we used FSUS (and not TSC) as the basis for “Rockfish” and “POP” time series of trawl landings. Even though “Rockfish” and “POP” trawl landings were consistent between TSC and FSUS (Fig. 7) the records in those two sources were not always identical. Therefore, once we estimated per-species landings in each PFMC area and year from MPDSR, we summed them up across PFMC areas and divided by the year’s total landings, to calculate year specific proportion of each species. These year specific proportions were then applied to the reconstructed time series of “Rockfish” and “POP” landings (derived as described in the previous section) to obtain the final landed catch of different species, reported within “Rockfish” and “POP”, by year for the period between 1963 and 1977.

To apportion “Rockfish” landings to different species for the 1927-1962 period (before species composition sampling in Oregon began), we first pooled the amount of landed catch by species between 1963 and 1967, the earliest five years of routine composition sampling in Oregon, calculated proportions of different species within this pooled catch, and then applied these proportions to 1927-1962 “Rockfish” landings by year. For “POP”, for the period between 1946 and 1962 (after the POP fishery developed but before composition sampling in Oregon began), we calculated the proportions of species within “POP” from the 1963-65 period (the first 3 years of sampling) and applied these proportions to the early time series of “POP” landings. We used 3 instead of 5 years of data (as with “Rockfish”) to reflect changes in the “POP” composition observed when the Pacific ocean perch fishery collapsed in the mid-1960s. Prior to the collapse, almost 100% of the “POP” complex was Pacific ocean perch (Barss and Niska 1978). Beginning in the mid-1960s, the proportion of Pacific ocean perch within “POP” began to decrease. The decrease in the contribution of Pacific ocean perch to the “POP” complex was also reported by Tagart and Kimura (1982) for Washington landings. For this reason, it was considered reasonable to use the first three years of sampling (1963-1965) to better represent the historical catch of “POP” between 1946 and 1962; applying later data for that period would lead to underestimating Pacific ocean perch and overestimating other species.

A small portions of “Rockfish” and “POP” landings in the MPDSR were assigned to “Other” species. This “Other” category represented non-rockfish species landed within “Rockfish” and “POP” (Douglas, ODFW, pers. com.). In order to apportion the “Other”, we compared species compositions from the MPDSR with raw ODFW composition samples (RCS) of “Rockfish” and “POP” for the period between 1976 and 1982. These RCS were recently digitized and available for the reconstruction. RCS did not have a portion of catch assigned to “Other.” In comparing species compositions from MPDSR with RCS by year, we identified non-rockfish species that were listed in RCS, but not in MPDSR, and assumed those species comprise “Other” in MPDSR. The “Other” included species such as surfperch, lingcod, pacific cod and pacific hake. We then computed species proportions within “Other” individually for each year and applied estimated year specific proportions for 1976 and 1977. For the earlier period between (1927-1975 for “Rockfish”, and 1946-1975 for “POP”), we applied “Other” species proportions calculated from the pooled landings data by species for the period between 1976 and 1982.

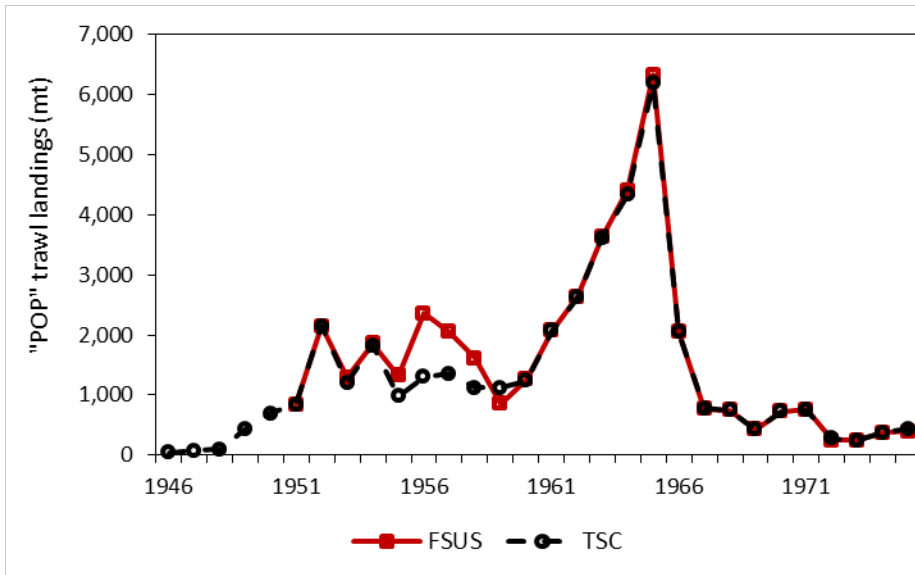
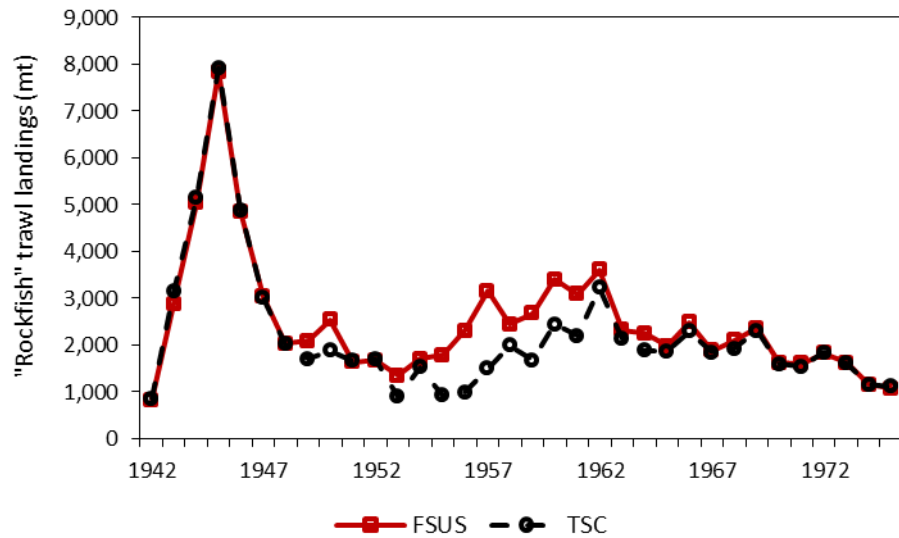


Figure 7. Comparison of trawl landings reported in FSUS and TSC for “Rockfish” (top panel) and “POP” (bottom panel).

4.1.1.3. 1978-1986

For the 1978-1986 period, ODFW trawl species composition samples were applied to trawl landed catch at the port level, since there have been differences in processor sorting practices among the ports. Port biologists documented these differences in 1984, when the category “Shelf/Slope Rockfish” (406) was created. Some processors sorted the “Unspecified Rockfish” (410) and “Shelf/Slope Rockfish” (406) categories as “Large Rockfish” and “Small Rockfish” respectively, but processors in other ports sorted species into “Unspecified Rockfish” and “Shelf/Slope Rockfish” as it was intended. No attempt was made to enforce consistency in sorting practices among ports, therefore, it was considered best to apply species compositions to landings at a port level when possible. Species composition samples were gathered from the different types of bottom trawl gear (large footrope and small footrope), even though the fish ticket information does not include these

details. Therefore, the samples from different trawl gear types were combined without a weighting procedure, as there was no data to support a separation of landings by specific trawl gear type.

Composition samples were collected in the major ports for each of the market categories during nearly all years. Since 1978, these major ports included Astoria, Newport, and Coos Bay. In 1979, Brookings was added to the list. The minor ports, such as Tillamook/Garibaldi, Charleston, Bandon and Port Orford, were rarely sampled, and those few samples could not be used. We used the Coos Bay samples for Charleston because the two ports are located in the same bay, and the present day coding of fish tickets combines these two ports into one. For the minor ports, a combined species composition samples specific to a given year were applied. We combined all of each port's composition samples within a year, weighted to the amount of landings sampled.

For mid-water and shrimp trawl, year specific species composition samples (weighted by the amount of catch landed) were used when possible. We found, however, that often, only the "Large Rockfish" (410) category was sampled, so the remaining categories had to be assumed from a different time period. For this, samples from 1985-1993 were used; these samples were first weighted by landed catch within corresponding market categories and then combined to reflect market categories that existed in the historical time period (Fig. 1). For shrimp trawl, there were two gear types specified in fish tickets: single rigged and double rigged. Composition samples were collected only from double-rigged trips; instead of assuming single-rigged gear samples from a different time period, the double-rigged compositions were used for both shrimp trawl gear types.

The "Thornyheads" market category was created in 1984 and two thornyhead species (longspine and shortspine) started to be distinguished. Prior to that, all thornyheads were assigned by the port biologists to the "Shortspine Thornyhead" (568), the only thornyhead category present at that time in the species composition form used by the ODFW port biologists. The landings of shortspine thornyhead, therefore, may be somewhat overestimated in historical period. However, it is likely that prior to late 1980s (before a fishery targeting longspine thornyhead developed in Coos Bay and then Astoria) landings of longspine thornyhead were minimal, since most of the fishing fleet did not extend to the deep waters of the continental slope where longspine thornyhead occur.

The species-specific landings were also updated for the period between 1981 and 1986 even though landings data for that period existed in PacFIN. Species compositions of multi-species market categories for the 1981-1986 period were originally applied to landings data by ODFW before being sent to PacFIN, rather than sending the species composition information to PacFIN separately from landings data and applying species compositions to landings at the PacFIN level, as it has been done since 1987.

It is common for species composition samples of a multi-species market category to include proportions for "Unspecified Rockfish" or "Other Rockfish" (URCK or ORCK). Historically, some of the species assigned to "Unspecified Rockfish" or "Other Rockfish" were those that did not have species-specific codes at the time of sampling (e.g., cowcod), though they have since been added to code lists. Even landings in a single species market category could have had a portion of catch assigned by a port sampler to "Unspecified Rockfish" or "Other Rockfish" due to lack of a code for the species or the inability to identify the fish to species. When PacFIN applies species composition data to estimated landings of a market category, "Unspecified" or "Other Rockfish" are commonly

assigned to nominal species of the corresponding market category. For example, “Unspecified Rockfish” or “Other Rockfish” within the POP category would be assigned to nominal Pacific ocean perch, with code POP2. However, between 1981 and 1986 ODFW provided landings data to PacFIN with species compositions already applied, and URCK and ORCK from different market categories were combined together (instead of being assigned to nominal), resulting in large amounts of rockfish reported as URCK or ORCK. In 1982 for example, there were 7.5 million pounds reported within Oregon’s “Other Rockfish” category in PacFIN. The procedure used by ODFW in the early 1980s for applying species compositions was not documented, and no information is currently available on which portion of these combined ORCK landings came from which market category.

We used original species composition samples to recalculate contributions of different species landed within multi-species market categories between 1981 and 1986, and sorted landings previously attributed to URCK and ORCK.

4.1.2. Non-Trawl Landings

Landings of rockfish species with gear types other than trawl have been traditionally low. Sampling of the species composition of non-trawl rockfish landings was also minimal, yielding inadequate sample sizes. Consequently, for most of the historical period, information on year and gear specific species compositions for non-trawl landings was unavailable (Table C1, Appendix C). Consistent sampling of non-trawl gears for species compositions began in 1985 and sampling efforts have increased gradually over the years (Table 4).

Table 4. The number of species composition samples collected within different time periods from landings made by selected non-trawl gear types.

Gear	1985-1986	1985-1991	1985-1993
Troll	0	0	0
Fish Pot	0	1	4
Shrimp Pot	0	3	3
Hook & Line	2	13	204
Longline	13	35	131

Prior to 1978, when ODFW electronic fish ticket line (PV) became available, FSUS was the only source that reported landings of market categories by gear. Per FSUS, most of the historical non-trawl landings were made by either longlines or troll gear. A small portion of non-trawl landings were also made by other gear types.

4.1.2.1. *Longlines*

To inform species composition of historical longline landings of “Rockfish” and “POP” market categories, we used longline species composition samples collected between 1985 and 1993 weighted by the landed catch within a corresponding market category. The proportions of different species in each market category were calculated from the pooled 1985-1993 landings data and applied to the historical time period. Since market categories have changed over time and more rockfish market categories existed during 1985-1993 than in the historical period (Fig. 1), per

species landings from 1985-1993 relevant categories were combined to reflect historical category totals.

4.1.2.2. *Troll*

Species composition of troll caught rockfish had never been sampled historically, or the samples were not retained (Table 4). Therefore, we used information collected between 1995 and 2001 to estimate proportions of different species landed by troll. In 2000-2001, rockfish market categories were further separated (compared to 1995-1999 period), so we first adjusted the categories existed in 1995-1999 to reflect those in 2000-2001 by applying ratios of the categories in 2000-2001 to the 1995-1999 period. Troll caught categories, such as “Yellowtail”, “Widow”, “Black”, “Blue”, and “Canary Rockfish” were assumed to be pure, and no species compositions were applied to their landings. We simply used proportions of landings of each of these categories (calculated from the pooled 1995-2001 data) to estimate contribution of these species to historical troll rockfish landings.

The contributions of “Nearshore Rockfish” (401), “Shelf Rockfish” (402) and “Slope Rockfish” (406) categories were also estimated and applied to the historical time series of troll landings. No species composition samples were available for these market categories, and the species specific catch estimates from the Oregon Recreational Boat Survey (ORBS) data for ocean salmon troll trips from 2001-2010 were used. We calculated amounts of rockfish (either released or retained) from salmon troll trips using the weight of species caught as reported in the Recreational Fisheries Information Network (RecFIN) database. Species of the categories assumed pure (yellowtail, widow, black, blue, and canary rockfish) were excluded, and the remaining rockfish were separated into the “Nearshore Rockfish” and “Shelf Rockfish”. No “Slope Rockfish” were caught recreationally by troll gear, and “Slope Rockfish” species compositions were assumed to be the same as those of “Shelf Rockfish”. We calculated proportions of different species within each of the two categories, and applied them to historical troll rockfish landed commercially within the same categories. The number of rockfish market categories changes over time, therefore estimated proportion of different species also varied among time periods (Table C2, Appendix C).

The estimated troll rockfish species compositions indicate a large proportion of yellowtail, which is similar to what port biologists recall as being caught in the early troll fishery (Douglas, ODFW, pers. comm.). This is also consistent with the fact that yellowtail is a semi-pelagic species (Love et al. 2002).

The “POP” (413) category was also landed with troll gear. However, no “POP” was reported in the recreational data, and therefore, “POP” in troll landings was designated as pure “POP” with no additional species compositions applied.

4.1.2.3. *Other non-trawl gear*

Non-trawl landings made by other gear types other than longline and troll were minimal, and we combined them into an “Other Gear” category. Gear composition of “Other Gear” changed over time, and we used all available historical information to reflect the changes.

Prior to 1938, “Other Gear” landings were most likely caught with hook & line (since it was the only gear, aside from longline and troll, mentioned in the literature as existing at that time). Species

composition samples of “Hook & Line” landings which were collected between 1985 and 1993 were used to inform species composition of the “Other Gear” category in landings reported prior to 1938.

Between 1938 and 1959, FSUS reported non-trawl landings by “Shark Gill Nets” or “Drift Nets”. The “Shark Nets” were mostly used in the soupfin shark fishery. The shark fishery in Oregon began around 1940 (Westrheim 1950). Until about 1943, sharks were caught with longline gear, but in 1943 the “Diver Nets”, a fixed net anchored near the bottom, completely replaced “Longlines” as the gear of choice. The “Diver Nets” were used until 1945, and then were replaced by the “Floater Nets”, a gear deployed near the surface (3-11 fathoms) at night. For 1938-1944 period, the “Longline” species composition samples collected between 1985 and 1993 were used to represent “Longlines” and “Diver nets” landings and inform species compositions of “Other Gear” category. The “Floater Nets” used between 1945 and 1959 were assumed to be represented by both “Troll” and “Mid-water Trawl”, since the difference between “Troll” and “Mid-water Trawl” is the depth at which gear is deployed, and it is not known at what exact depth fishermen used their floater nets. The species compositions for “Troll” and “Mid-water Trawl” were equally weighted and combined to inform those of “Floater Nets”. The species compositions of the mid-water trawl were taken from 1985-1993 samples.

For the rest, “combined species compositions” were developed for “Rockfish” and “POP” using samples collected between 1985 and 1993. As already mentioned, during the 1985-1993, there were more market categories than in earlier years (Fig. 1); therefore, samples collected between 1985 and 1993, a period with further-separated market categories, were combined to match relevant market categories existed in historical period(s). To develop a “combined species composition” we first weighted individual species composition samples made between 1985 and 1993 by the associated landing size, so that a sample represents the whole landing. We then summed the weighted pounds within the given year group (Table C3, Column A) by the gear (Table C3, Column B) and market category (Table C3, Column C), to calculate the overall weighted pounds sampled (F). We calculated the proportions of different species (Table C, Column G) within each market category. We then summed the landings (Table C3, Column H) for 1985-93 for each market category and gear type. We then applied species proportions (Table 32, Column G) to the overall landings (Table C3, Column I) so that each category is weighted by landings. We summed these over all categories, and calculated the proportions represented in the “Rockfish” or “POP” category from previous years.

There were only three species composition samples collected from landings with fish pot gear between 1985 and 1993 (Table 4). More were collected in the late 1990s, but it would be difficult to use these later data, as the categories and fishery management regulations had changed significantly over the years. We applied these few species composition samples to the fish pot landings, and also to the rockfish caught with crab pots, since these had never been sampled.

Landings of a few market categories made by a specific non-trawl gear have never been sampled for species composition. In such instances, we used compositions from a similar gear type to inform species compositions of non-sampled gears (Table 5).

Table 5. Species compositions borrowed for different gear (if a cell is blank, specific comps existed).

Gear Code	Gear Description	Market Categories					
		406 POP1	410 URCK	413 POP2	431 WDW1	433 YTR1	468 THDS
300	Fish Pot			340	350	350	300*
400	Crab Pot	300	300	340	350	350	300*
330	Squid Trawl		380				
430	Scallop Dredge	390	390		390		
340	Hook & Line						300*
350	Longline			340			
360	Midwater Trawl						390
370	Shrimp Trawl - Single Rig	380	380	390	380	380	390
380	Shrimp Trawl - Double Rig			390			390
390	Bottom Trawl						

*A sample with gear 300 in 1994 and 2004 showed the 468 category was 100% Shortspine, which was used as the composition

4.2. Flatfish

4.2.1. Trawl Landings

The FSUS, which was used as the basis for historical flatfish landings, reported flatfish landings within “Flounder, Sole” and “Flounder, Other” categories. To apportion landings from those two categories to individual species, the TSC records of more specific flatfish categories were used. Those specific categories included English, Dover, Petrale, Rock and Rex Soles as well as Starry Flounder; the rest of flatfish were combined into “Other Flatfish”. Since there were no historical data on what comprised the TSC’s “Other Flatfish”, PV were used to assume contribution of different species to this category. Prior to 1994, in PV there were a few flatfish categories (that comprised “Other Flatfish”) that needed further refinement. These categories included “Miscellaneous Sole”, “Curlfin Sole”, and “Pacific Sanddabs”. To inform species compositions of “Miscellaneous Sole”, we used composition samples collected from flatfish landings between 1995 and 2004. We excluded major flatfish categories (already reported separately in TSC), and assumed the rest to be part of “Miscellaneous Sole” – comprised of deepsea sole, C-O sole and honeyhead turbot. The corresponding proportions of these species were then applied to the early PV landings of “Miscellaneous Sole”. Between 1969 and 1977, Curlfin sole was included in the PV’s “Arrowtooth Flounder”, and in 1978 a market category “Curlfin Sole” was created. To separate curlfin sole from arrowtooth flounder for the 1969-1977 period, we calculated a ratio of curlfin sole to arrowtooth flounder from the 1978-82 fish ticket data and applied this ratio to 1969-1977 period. Finally, “Pacific Sanddabs” was further separated into the Pacific and Spotted Sanddab species, based on flatfish species composition data collected between 1995 and 2004.

Once all the PV categories were separated to the species level, the minor flatfish proportions were calculated from pooled landings of these minor flatfish species between 1969 and 1971, the earliest three years of PV data. We used the earliest three years of data to avoid overestimating arrowtooth flounder in historical landings, since landings of “Arrowtooth Flounder” exhibited a large increase

in 1972 and 1973. The proportions of minor flatfish were then applied to the TSC “Other Flatfish” records. Then, TSC records were used to calculate year specific proportions of different flatfish species, and these proportions were applied to FSUS trawl landings of flatfish. The combined landings of flatfish between 1942 and 1946 (the earliest 5 years of TSC records) were applied to landings made prior to 1942. These same species compositions were used for flatfish landings made by single- and double-rigged shrimp trawl gear. A flow chart in Fig. 8 and Table 8 illustrate the approach used to reconstruct individual species’ estimates of flatfish landings.

Since 1995, the major flatfish categories were also sampled for species composition. In general, the single species flatfish categories were less than 3% contaminated with other species, the percentage of contamination varied among flatfish category. These species compositions were not applied to the historical major flatfish landings, as there are concerns that the samples might be not accurate. It was suspected that after species composition samples were collected, flatfish were further separated on the fillet line and the fish tickets were adjusted, making the composition samples invalid. At this time, the extent of re-sorting on the fillet line is not known, therefore the flatfish composition samples were disregarded, except for those from the “Pacific Sanddab” category. It was assumed that the two species of sanddab would not be re-sorted as they are similar in appearance and value. The ratio of spotted to pacific sanddabs was calculated from combining all flatfish compositions between 1995 and 2004; the expanded pounds of these two species within all categories were then used to create a ratio.

4.2.2. Non-Trawl Landings

Since 1978 non-trawl landings by gear were reported by PV for most flatfish. A few species in PV were combined into “Miscellaneous Sole”, and samples collected between 1995 and 2004 were used for the species composition of “Miscellaneous Sole”, as was done in case of trawl flatfish landings.

To derive pre-1978 non-trawl landings of individual flatfish species, we first calculated proportions of pre-1978 gear types in non-trawl flatfish landings using 1978-1982 (the earliest available) PV data. The 1978-1982 PV data were pooled together to calculate pre-1978 gear proportions. Pre-1978 non-trawl gear types included longline, troll, and other gear. We used species compositions samples collected between 1985 and 1993 (the earliest available) weighted by the amount of catch landed by different gear types to estimate species composition of non-trawl landings made by longline, troll, and other gear. These species compositions were applied to the entire historical time period, prior to 1978.

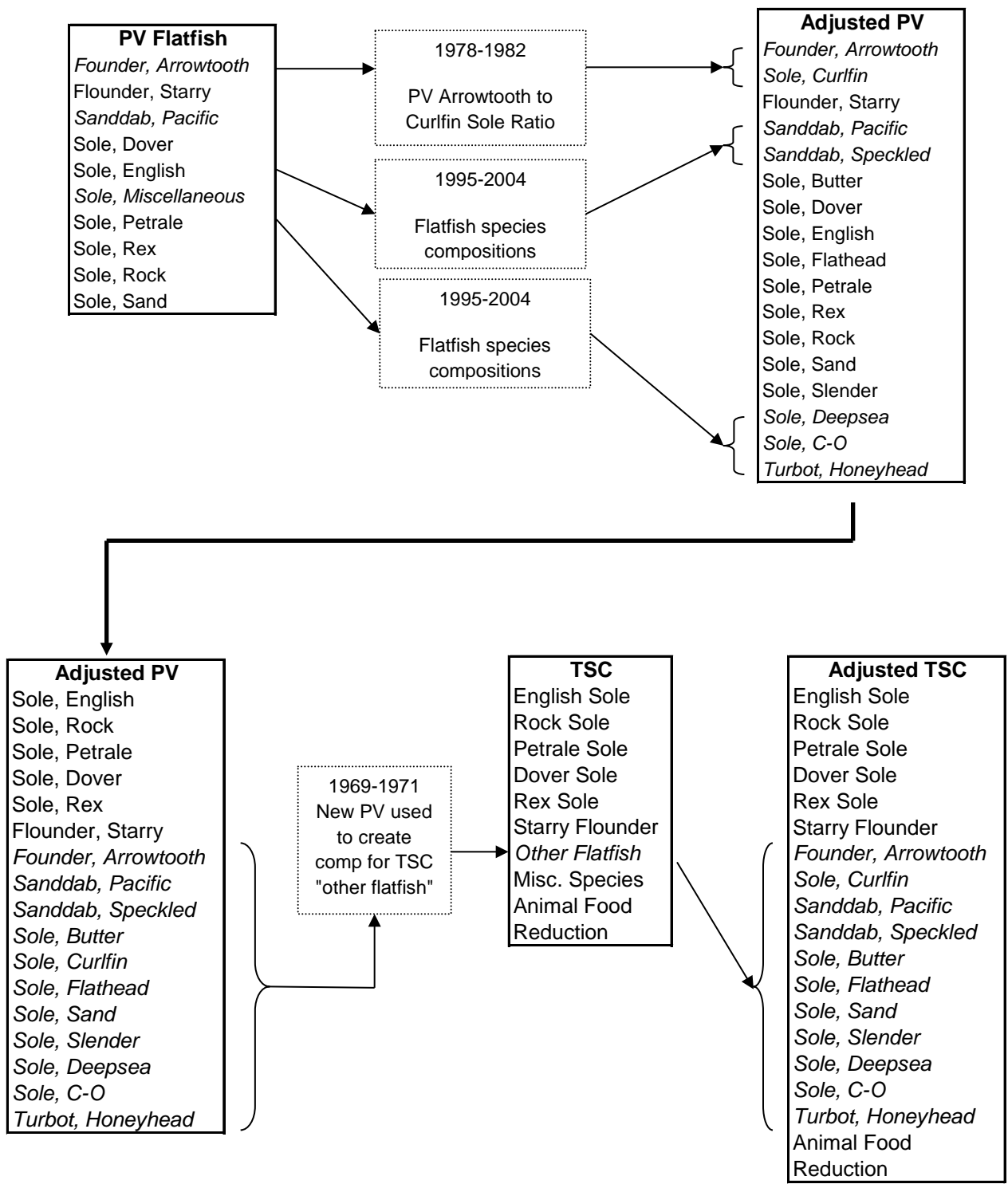


Figure 8. The flowchart describes the methods for estimating the flatfish species included in the PV “Miscellaneous Sole” and TSC “Other Flatfish” categories.

4.3. “Animal Food”

Three data sources were available to inform the contributions of different species to the “Animal Food” market category (Table 1). These sources included Jones and Harry (1961), Niska (1969) and Demory (1974). Jones and Harry (1961) reported species compositions for “Animal Food” landings for 1953-1956, Niska (1969) for 1958-1965, and Demory (1974) for 1974. The data in these three sources were reported differently so various approaches were used for creating species compositions for different time periods.

Jones and Harry (1961) was used to inform year specific species compositions for the 1953-1956 period. The source reported proportions of the major flatfish species (such as Dover, English, Petrale, Bellingham, Rex soles and Arrowtooth) within the “Animal Food”, as well as proportions of rockfishes and miscellaneous fishes. The miscellaneous category contained both the minor flatfish and other species (such as Sea Poachers and Skate). Jones and Harry provided a list of these minor species, but did not report on their specific amounts. For the reconstruction, we divided the amount of miscellaneous fish landed equally among the six minor flatfish and 13 other species listed. Jones and Harry reported year specific proportions of the six most commonly caught rockfish species, as well as a list of the minor rockfish species caught. We apportioned the minor rockfish landings equally among the species listed by Jones and Harry, since individual proportions of minor rockfish were not provided. Flag rockfish (reported as one of the major rockfish species) was renamed to redbanded rockfish, since in early time period these were often misidentified (Love et al. 2002); the MPDSR also had no flag rockfish in any of the species composition samples.

Niska (1969) was used to create year-specific compositions for the 1958-1965 period. Niska (1969) reported proportions and landed weight for the major flatfish (by species), miscellaneous sole, miscellaneous fish and rockfish. The proportions of species in these miscellaneous groups were not provided, and only the individual species comprising those groups were listed. For the reconstruction, we divided the amount of “miscellaneous sole” equally among the seven minor flatfish species listed, and the amount of “miscellaneous fish” equally among the 15 species listed. For the “miscellaneous fish”, we changed the generic sculpin listings to buffalo sculpin, which has been the most common sculpin landed in Oregon (based on recent species composition samples). We separated the “skate” category into species using actual skate composition samples taken between 1995 and 2004, weighted by landed catch within each trip. Rockfish species composition (the list of 9 species) was provided only for 1965, and no individual contributions were reported. From 1965 forward, we used this 1965 data to equally apportion catch reported in “rockfish” group among 9 rockfish species listed. To apportion the “rockfish” landed between 1958 and 1964 by species, weighted “rockfish” compositions from Jones & Harry (1961) were used.

The 1974 species proportions in “Animal Food” were described in a letter to the National Marine Fisheries Service (Demory 1974), which had requested Oregon to breakdown species in the “Animal Food” category. The letter included the list of major species in “Animal Food”, but did not provided proportions of rockfish, “miscellaneous”, “mixed sole” and “unspecified” groups. The species in each of these groups were assumed from Niska (1969). The rockfish proportions, reported by Niska (1969) were applied to “Animal Food” rockfish landings in 1974. The minor flatfish listed in Niska were equally distributed within the Demory’s “mixed sole”. The “miscellaneous” and “unspecified” categories were combined and the amount was divided equally

among the 15 various miscellaneous species listed in Niska (1969); skate were listed separately in Demory (1974) so they were excluded from the various miscellaneous species.

For the period prior to 1953, we applied species proportions calculated from 1953-1956 pooled data reported in Jones and Harry (1961). For 1957, species proportions were assumed from Jones and Harry 1956 data and Niska 1958 records. For the 1965-1973, we used the species proportions calculated from 1961-1965 data reported by Niska (1969). Finally, for the period from 1974 forward, we used the proportions of species from Demory (1974). This information is schematically summarized in Table 9.

4.4. Miscellaneous Species

The purpose of this section is to provide information on the species composition of multi-species market categories other than those that include rockfish and flatfish. For some of these categories, there was only anecdotal information available about their species composition.

“Unspecified Surfperch” has never been sampled, and within the reconstruction species composition of the “Unspecified Surfperch” was not estimated. The recent samples of “Unspecified Surfperch” by port biologists suggest that most surfperch landed are redbtail surfperch, but historically, other species of surfperch might have been caught commercially in the bays. Cleaver (1951) mentioned that there was a small fishery that utilized several salt water perches, such as blue perch, silver perch, surf perch, and shiners. The “Smelt, Other” and “Eelpouts” categories were similar to surfperch; they were never sampled for species composition, and assuming species compositions for these categories was not possible.

It was not possible to create either a species composition or use actual species composition samples for the “Miscellaneous Sharks” category so these were left nominal. By 1980, the shark categories were further separated, but the species composition appeared to significantly change from the historical period. From 1986 to 1989, thresher sharks dominated the landings of all shark species, which is in contrast to historical information reported by Cleaver (1951) that soupfin shark was probably the dominant species caught; Cleaver provided the following information on shark composition:

“the soupfin shark was the most sought-after species, but many other species of sharks were also captured in the nets. In addition to dogfish, the minor shark species include the basking (*Cetorhinus maximus*), blue (*Prionace glauca*), bonito (*Isurus glaucus*), cow (*Notorynchus cepedianus*), hammerhead (*Sphyma zygaena*), mackerel (*Lamna ditropis*), mud (*Hexanchus griseus*), thresher (*Alopias vulpinus*), and tiger shark (*Galeocerdo cuvier*). Of these minor species, the blue shark is the most abundant. At times it was unfortunately more abundant than the soupfin shark which the fishermen were seeking.”

Other categories, such as “Clams, Mixed”, were highly variable in the composition of the species caught among years, therefore compositions were not estimated. Cleaver (1951) had the following notes on species composition in the 1940’s:

“The horseclam (*Schizothaerus nuttallii*), the cockle (*Cardium corbis*), and the soft-shell clam (*Mya arenaria*) form the bulk of the commercial catch with only negligible landings of Washington butter clam (*Saxidomus giganteus*) and little neck clam (*Venerupis staminea*). During the period 1943-1949 an average of 47 percent of the total production was horseclams, 34 percent was cockles, and 19 percent was soft-shell clams. All three species are used in the restaurant and fresh food trade. Cockles have additional use as fish and crab bait which takes a large part of the total cockle catch.”

Species of sturgeon had been combined until 1969, when the PV reports become available. To estimate composition of the “Sturgeon” category, a species composition was created by using the ratio of green to white sturgeon landed between 1969 and 1973. This composition was applied to landings of “Sturgeon” prior to 1969. Cleaver (1951) provided the following information on sturgeon composition:

“Two species of sturgeon, the green (*Acipenser medirostris*) and the white (*A. transmontanus*) are landed from time to time by the otter trawl fishermen. The green sturgeon, which is a marine form, is landed in greater numbers, but the landings are small. A peak of 23,000 pounds occurred in 1943, but since then the landings have declined to none in 1949. The white sturgeon is primarily a freshwater or brackish water resident and few are captured in the ocean. A peak landing of 199 pounds was made in 1943 by the otter trawlers.”

The “Skate” category was first sampled in 1995, and virtually all sampling efforts focused on trawl landings (only one sample was taken on skate landed by non-trawl gear), therefore the trawl skate species composition was applied to all gear types. The “Skate” species composition was determined based on samples from 1995-2004 (the earliest 10 years of sampling). The landed catch of all skate species was combined, the unrelated fish within the category were excluded, and species proportions were calculated from weighted average catch. This species composition was applied to skate landings prior to 1969 and was also used for skate landings within the “Animal Food” category discussed previously.

5. Reconstruction at a glance

We used a variety of methods to reconstruct species-specific landings from multi-species market categories. An overview of the data sources and approaches used for various time periods and market categories is presented in Tables 6-9, below.

Table 6. Schematic representation of the “Rockfish” reconstruction data sources and methods, by period.

Year	Landings	Gear	Comps	
			Trawl	Non-Trawl
1889-1898	OFGP	All landings are assigned to non-trawl. Non-trawl gear comps calculated from 1927-32 FSUS	NA	Species comps by gear type from 1985-93, weighted to produce historical categories
1899-1926	Interpolated			
1927-1945	FSUS	FSUS	Species proportions calculated from 1963-67 MPDSR	
1946-1950	TSC ratio of rockfish to sum of rockfish and POP, applied to FSUS “Rockfish”			
1951-1962	FSUS			
1963-1968			Year specific comps from MPDSR	
1969-1977	PV reports		Year and port specific comps for major ports; year specific comps for minor ports	
1978-1986	PV	PV		

Table 7. Schematic representation of the “POP” reconstruction data sources and methods, by period.

Year	Landings	Gear	Comps	
			<i>Trawl</i>	<i>Non-Trawl</i>
1946-1950	TSC ratio of POP to sum of rockfish and POP, applied to FSUS “Rockfish”	All landings assigned to trawl	Species proportions calculated from 1963-67 MPDSR	NA
1951-1962	FSUS	FSUS	Year specific comps from MPDSR	Species comps by gear type from 1985-93, weighted to produce historical categories
1963-1968				
1969-1977	PV reports			
1978-1986	PV	PV	Year and port specific comps for major ports; year specific comps for minor ports	

Table 8. Schematic representation of the reconstruction data sources and methods used for flatfish categories, by period.

Year	Landings	Gear	Comps	
			Trawl	Non-Trawl
1889-1898	OFGP	Non-trawl gear comps calculated from 1927-32 FSUS	NA	Species comps by gear type from 1985-93, weighted to produce historical categories
1899-1926	Interpolated			
1927-1931	FSUS	FSUS	Species proportions calculated from adjusted 1942-46 TSC comps	
1932-1941			Year specific adjusted TSC comps	
1942-1968	TSC ratio of flatfish to sum of flatfish and “Animal Food” categories, applied to FSUS flatfish categories	FSUS	Year specific adjusted TSC comps	
1969-1977	PV reports	Calculated from 1979-83 PV (FSUS categories not applicable to PV)	Year specific PV for major flatfish; Arrowtooth/Curlfin ratio from 1978-1982 PV, Pacific Sanddab comps and “Other Sole” comps from 1994-2004 PV used	
1978-1986	PV	PV		

Table 9. Schematic representation of the “Animal Food” reconstruction data sources and methods, by period.

Years	Landings	% Major Categories	Minor Rockfish Comps	Misc. Fish Comps
1942-1952	TSC ratio of “Animal Food” to sum of flatfish and “Animal Food” categories, applied to FSUS flatfish categories	Calculated from 1953-1956 Jones & Harry	Calculated from 1953-1956 Jones & Harry	Calculated from 1953-1956 Jones & Harry
1953-1956		Year specific from Jones & Harry	Landings distributed evenly among 8 species listed Jones & Harry	Landings divided evenly among 6 minor flatfish and 13 “other” species listed in Jones & Harry
1957		Calculated from 1956 Jones & Harry and 1958 Niska	Calculated from 1953-56 Jones & Harry	Calculated from Jones & 1956 Harry and 1958 Niska
1958-1959		Year specific from Niska		“misc. sole” divided evenly among 7 minor flatfish listed in Niska, “misc. fish” divided evenly among 15 “other” species listed in Niska
1960-1964				
1965				
1966-1968		Calculated from 1961-1965 Niska	From Niska (for 1965) for 7 major species, landings of minor species distributed evenly among 9 species	
1969-1973	Demory			
1974-1986		PV		

6. Electronic Data File and Version Changes

This report is associated with a data file, Oregon_commercial_landings_1889-1986_v1.0.xls. The name of the file will change with a new version number if future modifications are made to the OCL. The associated version number will inform users of changes that have been made, which will be documented in this section below. The most current version will be housed at PacFIN and all future updates will replace that copy.

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Appendix A

Table A1. List of species included in the reconstruction.

Species Code	Common Name	Scientific Name
014	Pacific Lamprey	Lampetra Tridentata
020	Sharks	N/A
023	Thresher Shark	Alopias Vulpinus
029	Soupin Shark	Galeorhinus Zyopterus
031	Blue Shark	Prionace Glauca
035	Spiny Dogfish Shark	Squalus Acanthias
039	Aleutian Skate	Bathyraja Aleutica
040	Pacific Electric Ray	Torpedo Californica
042	Big Skate	Raja Binoculata
043	California Skate	Raja Inornata
045	Sandpaper Skate	Raja Kincaidi
046	Longnose Skate	Raja Rhina
047	Starry Skate	Raja Stellulata
048	Black Skate	Bathyraja Trachura
049	Spotted Ratfish	Hydrolagus Colliei
051	White Sturgeon	Acipenser Transmontanus
052	Green Sturgeon	Acipenser Medirostris
054	American Shad	Alosa Sapidissima
055	Pacific Herring	Clupea Harengus Pallasi
056	Pacific Sardine	Sardinops Sagax
058	Northern Anchovy	Engraulis Mordax
061	Pink Salmon	Oncorhynchus Gorbuscha
062	Chum Salmon	Oncorhynchus Keta
063	Coho Salmon	Oncorhynchus Kisutch
064	Sockeye Salmon/ Kokanee	Oncorhynchus Nerka
065	Chinook Salmon	Oncorhynchus Tshawytscha
078	Rainbow Trout (steelhead)	Oncorhynchus Mykiss
100	Smelts	N/A
106	Eulachon	Thaleichthys Pacificus
129	Common Carp	Cyprinus Carpio
180	Catfishes	N/A
201	Pacific Cod	Gadus Macrocephalus
203	Pacific Whiting (hake)	Merluccius Productus
204	Pacific Tomcod	Mircogadus Proximus
205	Walleye Pollock	Theragra Chalcogramma
211	Pacific Grenadier	Corphaenoides Acrolepis
220	Eelpouts	N/A
250	Opah	Lampris Guttatus
262	Striped Bass	Morone Saxatilis
265	White Sea Bass	Atractoscion Nobilis
286	Walleye	Stizostedion Vitreum Vitreum

Table A1 (Continued). List of species included in the reconstruction.

Species Code	Common Name	Scientific Name
290	Jack Mackerel	Trachurus Symmetricus
300	Surfperches	N/A
327	Monkeyface Prickleback	Cebidichthys Violaceus
350	Wolf-eel	Anarrhichthys Ocellatus
352	Giant Wrymouth	Delopepis Gigantea
371	Black Skipjack	Euthynnus Lineatus
372	Skipjack Tuna	Euthynnus Pelamis
373	Pacific Bonita	Sarda Chiliensis
374	Chub Mackerel	Scomber Japonicus
375	Albacore	Thunnus Alalunga
376	Yellowfin Tuna	Thunnus Albacares
378	Bluefin Tuna	Thunnus Thynnus
412	Rougheye Rockfish	Sebastes Aleutianus
413	Pacific Ocean Perch	Sebastes Alutus
416	Brown Rockfish	Sebastes Auriculatus
417	Aurora Rockfish	Sebastes Aurora
418	Redbanded Rockfish	Sebastes Babcocki
419	Silvergray Rockfish	Sebastes Brevispinis
420	Shortraker Rockfish	Sebastes Borealis
421	Copper Rockfish	Sebastes Caurinus
422	Greenspotted Rockfish	Sebastes Chlorostictus
426	Darkblotched Rockfish	Sebastes Crameri
428	Splitnose Rockfish	Sebastes Diploproa
429	Greenstriped Rockfish	Sebastes Elongatus
430	Puget Sound Rockfish	Sebastes Emphaeus
431	Widow Rockfish	Sebastes Entomelas
433	Yellowtail Rockfish	Sebastes Flavidus
435	Chilipepper	Sebastes Goodei
436	Rosethorn Rockfish	Sebastes Helvomaculatus
438	Shortbelly Rockfish	Sebastes Jordani
441	Quillback Rockfish	Sebastes Maliger
442	Black Rockfish	Sebastes Melanops
443	Blackgill Rockfish	Sebastes Melanostomus
444	Vermilion Rockfish	Sebastes Miniatus
445	Blue Rockfish	Sebastes Mystinus
446	China Rockfish	Sebastes Nebulosus
447	Tiger Rockfish	Sebastes Nigrocinctus
448	Speckled Rockfish	Sebastes Ovalis
449	Bocaccio	Sebastes Paucispinis
451	Canary Rockfish	Sebastes Pinniger
453	Redstripe Rockfish	Sebastes Proriger

Table A1 (Continued). List of species included in the reconstruction.

Species Code	Common Name	Scientific Name
454	Grass Rockfish	Sebastes Rastrelliger
455	Yellowmouth Rockfish	Sebastes Reedi
456	Rosy Rockfish	Sebastes Rosaceus
457	Yelloweye Rockfish	Sebastes Ruberrimus
459	Bank Rockfish	Sebastes Rufus
460	Stripetail Rockfish	Sebastes Saxicola
466	Pygmy Rockfish	Sebastes Wilsoni
467	Sharpchin Rockfish	Sebastes Zacentrus
468	Shortspine Thornyhead	Sebastolobus Alascanu
469	Longspine Thornyhead	Sebastolobus Altivelis
477	Sablefish	Anoplopoma Firmbria
484	Lingcod	Ophidon Elongatus
523	Buffalo Sculpin	Enophrys Bison
556	Cabezon	Scorpaenichthys Marmoratus
560	Poachers	N/A
603	Speckled Sanddab	Citharichthys Stigmaeus
604	Pacific Sanddab	Citharichthys Sordidus
606	Arrowtooth Flounder	Atheresthes Stomias
607	Deepsea Sole	Embassichthys Bathybius
608	Petrale Sole	Eopsetta Jordani
610	Rex Sole	Glyptocephalus Zachirus
612	Flathead Sole	Hippoglossoides Ellassodon
614	Pacific Halibut	Hippoglossus Stenolepis
618	Butter Sole	Isopsetta Isolepis
620	Rock Sole	Lepidopsetta Bilineata
622	Slender Sole	Lyopsetta Exilis
624	Dover Sole	Microstomus Pacificus
626	English Sole	Parophrys Vetulus
628	Starry Flounder	Platichthys Stellatus
630	C-o Sole	Pleuronichthys Coenosus
632	Curlfin Sole	Pleuronichthys Decurrens
634	Sand Sole	Psettichthys Melanostictus
637	Horneyhead Turbot	Pleuronichthys Verticalis
670	Ocean Sunfish	Mola Mola
729	Tube Worm	Pista Pacifica
801	Pink Shrimp	Pandalus Jordani
805	Ghost Shrimp	Callianassa Californiensis
806	Mud Shrimp	Upogebia Pugettensis
807	Brine Shrimp	Artemia Salina
821	Tanner Crab	Chionocetes Bairdi
822	Box Crab	Lopholithodes Foraminatus

Table A1 (Continued). List of species included in the reconstruction.

Species Code	Common Name	Scientific Name
824	Dungeness Crab (ocean)	Cancer Magister
825	Dungeness Crab (bay)	Cancer Magister
827	Red Rock Crab	Cancer Productus
855	Crayfish	Pacifastacus Sp.
900	Clams, Other Bay	N/A
902	Basket Cockle	Clinocardium Nuttallii
904	Butter Clam	Saxidomus Giganteus
905	Gaper Clam	Tresus Capex
908	Native Littleneck	Protothaca Staminea
909	Soft-shelled Clam	Mya Arenaria
910	Razor Clam	Siliqua Patula
921	Pacific Oyster	Crassostrea Gigas
923	Native Oyster	Ostrea Lurida
931	Ocean Mussel	Mytilus Californianus
933	Freshwater Mussel	
941	Weathervane Scallop	Patinopecten Caurinus
946	Market Squid	Loligo Opalescens
951	Giant Pacific Octopus	Octopus Dofleini
971	Red Sea Urchin	Strongylocentrotus Franciscanus
996	Whale Products	N/A

Appendix B

Table B1. Landings (in pounds) reported by the OFGP series, with interpolated values in red.

Market Category	Year									
	1889	1890	1891	1892	1893	1894	1895	1896	1897	1898
Carp			30,000	26,000	27,200	28,400	29,600	30,800	32,000	33,200
Catfish			10,000	18,500	43,000	43,000	116,000	86,000	87,000	65,000
Clams, Razor *			71,735	186,512	91,821	91,821	126,111	56,240	58,106	70,423
Clams, Mixed *			28,265	73,488	36,179	36,179	49,689	22,160	22,894	27,747
Crab, Dungeness								1,800	21,092	40,384
Crayfish					66,288	66,288	84,716	103,144	121,572	140,000
Halibut, Pacific				26,000	140,000	140,000	1,094,000	935,800	950,600	400,000
Herring, Pacific							2,000	4,333	6,666	9,000
Lingcod				26,000	14,500	14,500	100,600	221,252	222,250	15,000
Oysters			300,000	150,700	180,000	180,000	578,700	653,200	660,100	650,000
Sardine, Pacific		10,000	8,000							
Shad, American	50,000	20,000	50,000	55,500	60,000	60,000	165,800	442,500	450,500	215,000
Smelt	120,000	60,000	150,000	125,000	360,000	360,000	545,800	677,350	677,480	450,000
Steelhead										
Sturgeon	960,705	2,310,000	2,870,500	3,300,675	1,730,000	1,730,000	1,673,414	1,193,352	995,400	285,418
Surfperch								1,000	1,750	2,500
Tom Cod	10,000	10,000	10,000	8,500	8,400	8,400	57,200	61,900	62,000	15,000
Trout			40,000	30,500	15,500	15,500	29,300	97,011	164,722	232,433
Rockfish				84,000	84,000	84,000	21,600	5,200	5,300	3,000
Flounder								4,700	3,850	3,000

*Clams were reported as "Clams, Soft", this was renamed to "Clams, Mixed" and a ratio of "Clams, Mixed" to "Clams, Razors" was applied.

Table B2. Relevant FSUS footnotes regarding historical landings in specific market categories.
Note: There were no footnotes between 1927 and 1932.

Pacific Sardine

1935, 1937-43: The Oregon coast pilchard fishery was prosecuted entirely by Washington and California purse-seine vessels.

Shark, Dogfish

1940-54: Dogfish were caught almost entirely for the utilization of livers in the production of vitamin oils. Most of the carcasses were discarded.

1956: The poundage shown includes the total volume for grayfish caught. Most carcasses discarded at sea.

Shark, Dogfish and Shark, Other and Soupfin

1940: The grayfish yielded about 22,000 lbs of liver and the soupfin sharks 32,240 lbs of liver. *The exact lbs and value of liver for grayfish and soupfin included in the totals are listed from 1940-54 but not included in this summary.*

1953: The poundage shown includes the total volume for grayfish and sharks caught. Most carcasses discarded at sea.

Dungeness, Crab

1939-43: Weight of the crab is based on an average of 22 pounds per dozen.

1944-47: Weight of the crab is based on an average of 24 pounds per dozen.

1948-70: Weight of the crab is based on an average of 25 pounds per dozen.

Clams, Mixed and Clams, Razor

1933-70: Razor clams poundage is weight of steam shucked cleaned meat, which is 42% of the round weight. Mixed clams consist primarily of eastern soft-shell clams. The weight shown is the fresh shucked weight which is 21% of the round weight.

1971-77: Based on a yield of 25% meats for cockle, hard, and mixed clams and 42% meats for razor clams.

Mussels, Sea

1972-77: Based on a yield of 25% meats.

Oysters, Pacific and Oysters, Native

1938-43: Statistics on oysters are based on yields of 12% edible meats for both Pacific and Native Oysters.

1944-66: Pacific Oysters based on a yield of 12% meats.

1967-77: Statistics on oysters are based on yields of 12% edible meats for Pacific Oysters and 18% for native oysters.

Table B2. (Continued) Relevant FSUS footnotes regarding historical landings in specific market categories.

Tuna, Yellowfin, Skipjack, and Bluefin

1947, 1949: The catch of skipjack and yellowfin was taken by purse seines and lines south of the international boundary.

1950-53: The catch of skipjack and yellowfin was caught in waters off Central America but shipped to Oregon as products of American fisheries.

1955: Includes the following catch taken off South America and shipped to Oregon as products of American fisheries: Yellowfin 80,000 lbs, Skipjack 360,000 lbs.

1956: Includes the following catch taken off South America and shipped to Oregon as products of American fisheries: Yellowfin 1,140,000 lbs, Skipjack 10,000 lbs.

1957: Includes the catch of Skipjack and Yellowfin tuna taken off the coast of Latin America.

1958: All Skipjack and Yellowfin tuna were landed by California tuna vessels.

Various Categories

1941: Prior to 1941 the poundage of halibut, sablefish, lingcod and rockfishes reported represented the dressed weight of the fish landed. Beginning with the data for 1941, all catch statistics are shown in round weights. When the following species have been landed dressed, the poundage has been converted to round weight by multiplying by the following factors: Halibut, by 1.33; lingcod, rockfishes, and sablefish, by 1.43.

Whale, Oil

1961-62: Whale oil converted to pounds on a basis of 7.5 pounds per gallon.

Table B3. Standardization of market category names used in the reconstruction.

Standard Market Category	Other Names Used in the FSUS
Anchovy, Northern	Anchovies
Clams, Mixed	Clams, bay; Clams, soft (1927-31)
Cod, Pacific	Cod
Crab, Dungeness, Ocean	Crab
Crayfish	Crawfish
Eulachon	Smelt (1889-98)
Flounder, Sole (FSUS)	Flounder (1886-88)
Giant Pacific Octopus	Octopus
Halibut, Pacific	Halibut
Herring, Pacific	Herring, sea; Herring
Lamprey, Pacific	Unclassified (1946-47, verified from Cleaver)
Lingcod	Cultus Cod
Mackerel, Chub	Mackerel, Pacific Mackerel
Animal Food	Miscellaneous, Mink Food
Mussels, Ocean	Mussels
Oysters, Native	Oysters, Western; Oysters (1891-98)
Oysters, Pacific	Oysters, Japanese; Oysters (1975-80)
Pacific Ocean Perch	Ocean Perch
Salmon, Chinook	King
Salmon, Chum	Keta
Salmon, Coho	Silver
Salmon, Pink	Humpback
Salmon, Sockeye	Red
Sardine, Pacific	Pilchard; Sardine
Shad, American	Shad
Shark, Blue	Shark, Bluefin
Shark, Other	Shark, Unclassified
Shark, Spiny Dogfish	Grayfish; Shark, Grayfish
Shrimp, Pink	Shrimp, ocean; shrimp
Skates	Skates and Rays (only 718 lbs of Electric Rays were landed between 1978 and 2008)
Smelt, Eulachon	Smelt (1889-1934)
Smelt, Other	Whitebait; Smelt, Silver or Surf
Steelhead	Steelhead trout; Salmon and Mountain Trout; Trout
Surfperch	Perch

Appendix C

Table C1. The non-trawl landings made between 1978 and 1983 within multi-species rockfish market categories. Numbers in **bold** are year/ gear specific landings, for which species composition samples were taken. Numbers with * are year/gear specific landings with only few samples available.

Year	Gear	Gear Description	Market Category						Round Lbs	% of Year
			POP1 406	URCK 410	POP2 413	WDW1 431	YTR1 433	THDS 468		
1978	120	Troll	595049						595049	4.41%
	300	Fish Pot	8566						8566	0.06%
	340	Hook & Line	23706						23706	0.18%
	350	Longline	70335						70335	0.52%
	380	Shrimp Trawl - Double	1943550	25032				1968582	14.59%	
	390	Bottom Trawl - Unspecified	8917031		1909029		10826060	80.23%		
	400	Crab Pot	1530						1530	0.01%
1979	120	Troll	359925						359925	1.54%
	300	Fish Pot	15136	556				15692	0.07%	
	340	Hook & Line	330403						330403	1.41%
	350	Longline	261016	960				261976	1.12%	
	380	Shrimp Trawl - Double	2365380	156552				2521932	10.78%	
	390	Bottom Trawl - Unspecified	15862266		4035356		19897622	85.08%		
	400	Crab Pot	322						322	0.00%
1980	120	Troll	350443						350443	0.90%
	300	Fish Pot	1221	12				1233	0.00%	
	340	Hook & Line	180410						180410	0.46%
	350	Longline	69088						69162	0.18%
	360	Trawl - Midwater	19227724	26949				19254673	49.60%	
	380	Shrimp Trawl - Double	2321208	121302				2442510	6.29%	
	390	Bottom Trawl - Unspecified	13045940		3466657		16512597	42.54%		
	400	Crab Pot	7013						7013	0.02%
1981	120	Troll	205028						205028	0.38%
	300	Fish Pot	3758	9				3767	0.01%	
	330	Squid Trawl	49294						49294	0.09%
	340	Hook & Line	179839						179839	0.33%
	350	Longline	205818	569				206387	0.38%	
	360	Trawl - Midwater	31768970		47631*		31816601	58.44%		
	380	Shrimp Trawl - Double	1774544	81357				1855901	3.41%	
	390	Bottom Trawl - Unspecified	15897418		4221431		20118849	36.96%		
	400	Crab Pot	5563						5563	0.01%
1982	120	Troll	208948						208948	0.45%
	300	Fish Pot	5976	672				6648	0.01%	
	340	Hook & Line	425661						425661	0.91%
	350	Longline	209186	70				209256	0.45%	
	360	Trawl - Midwater	19198987		87803		19286790	41.26%		
	380	Shrimp Trawl - Double	1494521		13821*		1508342	3.23%		
	390	Bottom Trawl - Unspecified	19686046		5405764		25091810	53.69%		
	400	Crab Pot	1442						1442	0.00%
1983	120	Troll	208962						208962	0.59%
	300	Fish Pot	7026	35				7061	0.02%	
	330	Squid Trawl	3228						3228	0.01%
	340	Hook & Line	971378						971378	2.74%
	350	Longline	214965	28				214993	0.61%	
	360	Trawl - Midwater	4063374				4063374	11.45%		
	370	Shrimp Trawl - Single	20642	96				20738	0.06%	
	380	Shrimp Trawl - Double	960827		13083		973910	2.74%		
	390	Bottom Trawl - Unspecified	23838723		5178933		29017656	81.78%		
	400	Crab Pot	1977						1977	0.01%
430	Scallop Dredge	324						324	0.00%	

Table C1. (Continued) The non-trawl landings made between 1978 and 1983 within multi-species rockfish market categories. Numbers in bold are year/gear specific landings, for which species composition samples were taken. Numbers with * are year/gear specific landings with only few samples available.

Year	Gear	Gear Description	Market Category					Round Lbs	% of Year			
			POP1 406	URCK 410	POP2 413	WDW1 431	YTR1 433			THDS 468		
1984	120	Troll	74677					74677	0.26%			
	300	Fish Pot	1581					4	1585	0.01%		
	340	Hook & Line	624384						624384	2.18%		
	350	Longline	550	159618		56	73	160297	0.56%			
	360	Trawl - Midwater	20750*	340705	5688	8648707		9015850	31.41%			
	370	Shrimp Trawl - Single	62	11549	100		58	11769	0.04%			
	380	Shrimp Trawl - Double	746	349875*	900	67	20	351608	1.23%			
	390	Bottom Trawl - Unspecified	1450604	10665978	1570136	2986987		1785115	18458820	64.31%		
	400	Crab Pot	1095						1095	0.00%		
	430	Scallop Dredge	2446						2446	0.01%		
1985	120	Troll	123140					30	157	123327	0.43%	
	300	Fish Pot	3562					272	166	4000	0.01%	
	340	Hook & Line	512796					2		512798	1.78%	
	350	Longline	1310	275014	241	795	8296	1319	286975	0.99%		
	360	Trawl - Midwater	27684	73939	7000	7604198	114031	1995	7828847	27.14%		
	370	Shrimp Trawl - Single	89	24303			6		24398	0.08%		
	380	Shrimp Trawl - Double	4206	322166	615	4275	80515	13454	425231	1.47%		
	390	Bottom Trawl - Unspecified	2344890	8696957	1546637	1926551	2782875	2344825	19642735	68.09%		
	400	Crab Pot	1249						1249	0.00%		
	430	Scallop Dredge	3	20		8			31	0.00%		
1986	120	Troll	28	156447		266	1101		157842	0.61%		
	300	Fish Pot	23811					1878	1051	54	26794	0.10%
	340	Hook & Line	16	342803*			182		343001	1.32%		
	350	Longline	4261*	572504	849	1406	19778	2863	601661	2.32%		
	360	Trawl - Midwater	32387*	97356	9274	6865971	313210		7318198	28.26%		
	370	Shrimp Trawl - Single	1668	111435	219	512	5574	31	119439	0.46%		
	380	Shrimp Trawl - Double	9544	1300946	15492	10523	202960	1366	1540831	5.95%		
	390	Bottom Trawl - Unspecified	2045672	5306380	1357337	2555666	3125077	1394936	15785068	60.96%		
	400	Crab Pot	803						18	821	0.00%	

Table C2. Percentage of different rockfish species estimated in troll landings by time period.

SPECIES	Pre-1984	1984	1985-86
GRASS ROCKFISH	0.035%	0.105%	0.109%
BROWN ROCKFISH	0.036%	0.108%	0.112%
SILVERGRAY ROCKFISH	0.054%	0.160%	0.166%
GREENSTRIPED ROCKFISH	0.054%	0.163%	0.169%
ROSETHORN ROCKFISH	0.084%	0.252%	0.261%
BOCACCIO	0.107%	0.319%	0.330%
TIGER ROCKFISH	0.166%	0.497%	0.515%
CHILIPEPPER	0.174%	0.520%	0.538%
REDSTRIPE ROCKFISH	0.209%	0.624%	0.647%
ROSY ROCKFISH	0.244%	0.730%	0.756%
CHINA ROCKFISH	0.721%	2.157%	2.234%
COPPER ROCKFISH	0.798%	2.386%	2.472%
WIDOW ROCKFISH	1.161%	3.470%	N/A
BLUE ROCKFISH	1.273%	3.806%	3.943%
QUILLBACK ROCKFISH	1.291%	3.859%	3.998%
VERMILION ROCKFISH	4.266%	12.747%	13.205%
BLACK ROCKFISH	4.989%	14.915%	15.451%
YELLOW EYE ROCKFISH	5.440%	16.258%	16.842%
CANARY ROCKFISH	12.352%	36.924%	38.252%
YELLOWTAIL ROCKFISH	66.549%	N/A	N/A

Table C3. Example of how “Rockfish” species compositions landed by “Other Gear” were estimated.

A Yeargroup	B Gear	C Mkt_cat	D Species Code	E Species Name	F Expanded Sample Lbs	G %	H Landings	I Exp. to landings
1985-93	350	410, URCK	412	ROUGHEYE ROCKFISH	112654.27	55.25%	2742864	1515449
			413	PACIFIC OCEAN PERCH	302.65	0.15%		4071
			417	AURORA ROCKFISH	7.44	0.00%		100
			418	REDBANDED ROCKFISH	11119.90	5.45%		149587
			419	SILVERGRAY ROCKFISH	316.41	0.16%		4256
			420	SHORTRAKER ROCKFISH	8108.97	3.98%		109084
			421	COPPER ROCKFISH	90.41	0.04%		1216
			422	GREENSPOTTED ROCKFISH	1305.16	0.64%		17557
			426	DARKBLOTCHED ROCKFISH	600.32	0.29%		8076
			428	SPLITNOSE ROCKFISH	6.01	0.00%		81
			429	GREENSTRIPED ROCKFISH	1125.02	0.55%		15134
			431	WIDOW ROCKFISH	263.02	0.13%		3538
			433	YELLOWTAIL ROCKFISH	1167.98	0.57%		15712
			436	ROSETHORN ROCKFISH	104.42	0.05%		1405
			441	QUILLBACK ROCKFISH	318.73	0.16%		4288
			442	BLACK ROCKFISH	1387.43	0.68%		18664
			443	BLACKGILL ROCKFISH	4449.83	2.18%		59860
			444	VERMILION ROCKFISH	7.01	0.00%		94
			445	BLUE ROCKFISH	619.02	0.30%		8327
			446	CHINA ROCKFISH	35.54	0.02%		478
			447	TIGER ROCKFISH	146.50	0.07%		1971
			449	BOCACCIO	2843.44	1.39%		38251
			451	CANARY ROCKFISH	33194.20	16.28%		446535
			453	REDSTRIPE ROCKFISH	55.92	0.03%		752
			455	YELLOWMOUTH ROCKFISH	966.29	0.47%		12999
			456	ROSY ROCKFISH	110.16	0.05%		1482
			457	YELLOWWEYE ROCKFISH	20711.76	10.16%		278619
			467	SHARPCIN ROCKFISH	3.19	0.00%		43
			468	SHORTSPINE THORNYHEAD	1875.91	0.92%		25235
		431, WDW1	431	WIDOW ROCKFISH	190.00	100.00%	28633	28633
		433, YTR1	418	REDBANDED ROCKFISH	269.90	1.48%	212477	3136
			419	SILVERGRAY ROCKFISH	19.78	0.11%		230
			422	GREENSPOTTED ROCKFISH	10.39	0.06%		121
			426	DARKBLOTCHED ROCKFISH	3.57	0.02%		41
			429	GREENSTRIPED ROCKFISH	98.25	0.54%		1142
			431	WIDOW ROCKFISH	2081.31	11.38%		24187
			433	YELLOWTAIL ROCKFISH	14671.07	80.24%		170490
			436	ROSETHORN ROCKFISH	31.62	0.17%		367
			441	QUILLBACK ROCKFISH	19.52	0.11%		227
			442	BLACK ROCKFISH	109.49	0.60%		1272
			445	BLUE ROCKFISH	825.98	4.52%		9599
			447	TIGER ROCKFISH	107.58	0.59%		1250
			453	REDSTRIPE ROCKFISH	4.65	0.03%		54
		456	ROSY ROCKFISH	31.01	0.17%	360		
		468, THDS	468	SHORTSPINE THORNYHEAD	643.00	100.00%	48462	48462



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