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Observed and Estimated Total Bycatch of Salmon in the 2009 US West Coast Groundfish Fisheries

NOAA



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Introduction

The primary objective of this report is to provide estimates of salmon bycatch in U.S. West Coast groundfish fisheries for the calendar year 2009. We present observer discard ratios and estimated catch amounts (in number of individual fish) for three species: chinook salmon (*Oncorhynchus tshawytscha*), pink salmon (*Oncorhynchus gorbuscha*) and coho salmon (*Oncorhynchus kisutch*). This report includes estimates for all fisheries observed by the West Coast Groundfish Observer Program (WCGOP) that were recorded to have caught salmon during the 2009 calendar year. These include:

- Commercial limited entry (LE) bottom trawl
- Commercial fixed gear state-permitted nearshore (Oregon)

Fisheries observed by the WCGOP which did not have any observed bycatch of salmon during the calendar year 2009 included:

- Commercial LE bottom trawl - targeting California halibut
- Commercial open access (OA) bottom trawl - targeting California halibut
- Commercial LE fixed gear sablefish primary (tier endorsed)
- Commercial LE fixed gear non-primary sablefish (non-endorsed)
- Commercial OA fixed gear
- Commercial fixed gear state-permitted nearshore (California)
- Commercial shrimp trawl (Oregon and California)

Salmon bycatch in the Pacific whiting mid-water trawl fishery (as collected by the At-Sea Hake Observer Program) is presented by sector in an annual summary by the Northwest Regional Office (NWR 2009) and is included in this report for reference.

Data Sources

Data sources for this analysis include onboard observer data (from the WCGOP), trawl logbook data, and landing receipt data (referred to as fish tickets). Discard estimation analyses focused on commercial groundfish fishery sectors in which the WCGOP has conducted scientific at-sea observation of discards.

The WCGOP was established in 2001 by NOAA Fisheries (National Marine Fisheries Service, NMFS) (66 FR 20609). All commercial vessels that land groundfish caught in the United States Exclusive Economic Zone (EEZ) from 3-200 nautical miles offshore are required to carry an observer when notified to do so by NMFS or its designated agent. Subsequent state rule-making also requires vessels that fish for groundfish within 3 nautical miles of shore or participate in other state-managed fisheries to carry WCGOP observers when notified. The WCGOP's goal is to improve total catch estimates by collecting information on the discarded catch (fish returned overboard at-sea) of west coast groundfish species. The WCGOP coverage plan details program goals, vessel selection, observer coverage, and basic data collection (NWFSC 2006).

The sampling protocol employed by the WCGOP is primarily focused on the discarded portion of catch. In order to ensure that the recorded weights for the retained portion of the observed catch are accurate, haul-level retained catch recorded by WCGOP observers are reconciled with trip-level fish ticket records. The WCGOP data are linked to fish tickets by fish ticket number(s) obtained by the observer and are adjusted so

that the total trip pounds of retained fish equals the total trip pounds on the fish ticket. This is done because the fish ticket weight is more accurate and fish tickets are legally binding documents. These steps are described in further detail in annual reports produced by the WCGOP (www.nwfsc.noaa.gov/research/divisions/fram/observer/datareport/index.cfm) and were conducted prior to the analyses presented in this report.

When salmon are encountered on an observed vessel, WCGOP observers document total weight and number of fish for each species. In addition, they record length, weight, and sex for all or a subsample of individuals, note presence or absence of an adipose fin, and collect scales and snouts. Biological data for salmon have previously been summarized in WCGOP data reports for each fishery, which are available at: <http://www.nwfsc.noaa.gov/research/divisions/fram/observer/datareport/index.cfm>.

Logbook record-keeping is a state-mandated requirement for the LE groundfish trawl sector in Washington, Oregon, and California. A common-format logbook is used by all three states and completed logbook information is entered into state agency databases. The electronic logbook data are then submitted by state agencies to the Pacific Coast Fisheries Information Network (PacFIN) regional database, which is maintained by the Pacific States Marine Fisheries Commission (PSMFC).

Trawl logbook data for the calendar year 2009 were retrieved from the PacFIN database and divided into various sectors of the groundfish fishery as indicated in Figure 1. All additional data processing steps that were applied during the discard estimation process are described in the methods section below. Logbook data from the open access groundfish trawl sector were not included in our analyses, as no salmon were observed as bycatch in this sector.

Landing receipts, known as fish tickets, are completed by fish-buyers in each port for each delivery of fish by a vessel. Fish tickets are trip-aggregated sales receipts for market categories that may represent single or multiple species. They are issued to fish-buyers by a state agency and must be returned to the agency for processing. Fish tickets are designed by the individual states, and Washington, Oregon, and California each have a slightly different format of receipt. In addition, each state conducts species-composition sampling for numerous market categories that are reported on fish tickets. Fish ticket and species-composition data are submitted by state agencies to the PacFIN regional database. Percentages for the species composition within market categories were applied to the fish ticket data used in our analyses. As such, landed weights from sampled market categories were distributed to individual species to the greatest extent possible.

Fish ticket landings data for the calendar year of 2009 were retrieved from the PacFIN database and subsequently divided into various sectors of the groundfish fishery as indicated in Figure 1. All additional data processing steps that were applied during the discard estimation process are described in the methods section below.

Methods

A deterministic approach was used to estimate salmon discard for all sectors of the groundfish fishery for which WCGOP observer data were available. Through this approach, observed discard rates for each salmon species were directly expanded to the fleet-wide level. First, discard ratios were computed from observer data (OB) as the discarded number of each salmon species divided by the weight of retained catch of either all

groundfish (except Pacific hake) or other target species group, depending on the sector. Denominators differed for each sector of the fishery based on targeting behavior of that sector. Discard ratios were then multiplied by the total fleet-wide landed weight of either groundfish or other species or species group (depending on the denominator used to compute observed discard ratios).

This approach provided an expanded estimate of fleet-wide discarded numbers for each salmon species:

$$\text{Fleet-wide Salmon Bycatch} = \left(\frac{\text{\# of OB Discarded Salmon Species}}{\text{Weight of OB Retained Target Species}} \right) \times \text{Total Fleet-wide Landings of Target Species}$$

Because of differences in data availability and management structure among the various sectors of the groundfish fishery, this approach was applied with slight modifications for each sector. A more detailed discussion of the methodology used to estimate discard within each sector is presented below.

Limited Entry Bottom Trawl Fishery

Fleet-wide discard estimates for the LE bottom (non-midwater) trawl fishery were derived from WCGOP observer data, fish ticket landings data, and trawl logbook data. Fish ticket and logbook data were isolated for this sector based on processing steps outlined in Figure 1. A summary of observer data for the 2009 LE bottom (non-midwater) trawl sector is presented in a WCGOP data report published in October 2010 (NWFSC 2010a).

LE bottom trawl vessels that hold a California halibut bottom trawl permit may participate in the state-permitted California halibut fishery. California halibut tows can occur on the same trip as tows targeting groundfish and were identified in logbook and observer data based on the following criteria: 1) the reported tow target was California halibut or 2) the tow target was nearshore mix, sand sole, or other flatfish, and the tow took place in less than 30 fathoms and south of 40°10' N. latitude. All tows in the observer and logbook data that met at least one of the above requirements were removed from the LE bottom trawl data sets. Whether in observer or logbook data, tow target was typically determined by the vessel captain.

Several additional filtering steps were then applied to the data in order to ensure that we had distinguished the data set for the LE bottom trawl sector appropriately. First, we searched within the landings data for fish tickets with more than 2 mt of Pacific hake on a given day in order to remove them and exclude effort that was targeted exclusively towards this species. A similar check was then performed on the observer and logbook data, such that tows with more than 2 mt of retained Pacific hake were flagged for removal. On the basis of the Pacific hake catch criterion, five observed tows and one logbook tow met the criterion and all were removed from the 2009 data before analyses.

Next, trawl logbook and observer data were filtered to ensure that all spatial and temporal information was complete. Any tows lacking a recorded depth or latitude were removed. None of the tows in the 2009 observer data met these criteria. However, 13 tows were removed from the 2009 logbook dataset due to a lack of depth information.

Observer data and trawl logbook data were then stratified by area, season, and depth (Table 1). Records were separated into four areas: 1) north of Cape Falcon, Oregon (45.77° N lat.), 2) Cape Falcon to Cape Blanco, Oregon (42.75° N lat.), 3) Cape Blanco to the groundfish management line near Cape Mendocino, California

(40.16° N lat.), and 4) south of Cape Mendocino (Figure 1). Each area was divided into three depth strata (0-125, 126-250, > 250 fathoms). Two-month cumulative trip limit periods were combined to form two seasonal strata: winter (January-April and November-December) and summer (May-October). In some cases, if the numbers of observations in particular strata were too limited, data were aggregated across depth strata. During the winter, in the areas from Cape Flacon to Cape Blanco and South of Cape Mendocino, data were combined across the two shallower depth strata (0-125 and 126-250). In the area from Cape Blanco to Cape Mendocino during the summer, data were also combined across the two shallower depth strata. Aggregation must ensure representation of data from at least three vessels, and Table 1 presents our sample size as the number of tows and the total retained weight of all groundfish species included in the Pacific Fishery Management Council's (PFMC) Pacific Coast Groundfish Fishery Management Plan (FMP) (PFMC 2008), except Pacific hake.

It should be noted that this stratification scheme is inconsistent with the sampling design employed by the WCGOP. The authors recognize this fact, but used this method to provide estimates that were relevant within the spatial and temporal structure of salmon management. Measures of uncertainty are not provided as they would be biased by post-stratification.

Once both data sets had been stratified, we calculated initial discard estimates (D) by multiplying discard ratios (computed from observer data) by logbook catch weights in each stratum. This was done according to the following equation:

$$\hat{D}_{sxab} = \frac{\sum_t d_{sxt}}{\sum_t r_{xt}} \times \sum_t R_{xabt}$$

where:

- s : salmon species
- x : index strata (area, season, depth)
- a : state of landing (Washington, Oregon or California)
- b : bimonthly period (Jan-Feb, Mar-Apr, ... , Nov-Dec)
- t : tows in observer or logbook data
- d : observed number of discarded individuals of species s
- r : observed retained weight of all FMP groundfish except Pacific hake
- R : weight of retained FMP groundfish (except Pacific hake) recorded in logbooks
- D : initial discard estimate for species s in stratum x , state a and bimonthly period b

Note that the denominator of observed discard ratios (i.e., first term in the equation above) and the logbook expansion factor included weight from all FMP groundfish retained weight except Pacific hake. Pacific hake was excluded when using the retained FMP groundfish denominator because vessels that target or land large amounts of this species are considered to be part of Pacific hake sectors, which are distinct from the groundfish bottom trawl sector. A complete listing of groundfish species included in the Pacific Coast Groundfish Fishery Management Plan and used to compute and expand discard ratios is provided in Appendix A. Observed numbers and discard ratios for salmon species in the LE bottom trawl fishery are presented in Table 2 by area, season, and depth.

In all cases where FMP groundfish were used to compute discard ratios, any retained weights that were recorded by the observer but that did not appear on fish tickets were excluded from the denominator. This was necessary to prevent double-counting associated with differences in the species codes used by observers and processors. For instance, while observers may record rockfish catch at the species level, various species of rockfish are often grouped, weighed, and recorded together on the fish ticket by the processor under a grouped species code e.g., NUSP - northern unspecified slope rockfish. In some cases, this difference in species coding prevents observer and fish ticket weights from being matched and adjusted properly. Species coding on fish tickets varies considerably between processors and over time, and it is not possible to make assumptions regarding which individual observer-recorded species likely coincide with species grouping codes on fish tickets. Instead, by using only the retained groundfish weight from fish tickets in discard ratio denominators, we prevent double-counting of retained weights. This is not a factor when using a single species in the denominator, as any retained weights in observer and fish ticket data that share the same species code will match and adjust properly.

Retained logbook weights of FMP groundfish (except Pacific hake) were used to conduct the initial expansion of observed discard ratios to the fleet-wide level in this sector. However, logbooks are not submitted for 100% of trawl trips and therefore do not capture all groundfish bottom trawl fishing effort. As a result, it was necessary to adjust initial fleet-level discard estimates to reflect the level of effort indicated by fish ticket landings. To do this, both the fish ticket and logbook data were aggregated by state and bimonthly period, since this period of time is the same as most cumulative trip limit periods. An adjustment ratio was then computed for each state and bimonthly period as the weight of FMP groundfish (except Pacific hake) recorded on fish tickets divided by that recorded in logbooks. Adjustment ratios were computed separately for each state and bimonthly period to account for differences between individual states' logbook submission rates and fish ticket recording methods. Each adjustment ratio was multiplied by coinciding initial discard estimates and then summed across bimonthly periods, states, and spatial-temporal strata to produce coast-wide adjusted final discard estimates for each salmon species:

$$adj(\hat{D}_s) = \sum_x \sum_a \sum_b \hat{D}_{sxab} \times \frac{F_{ab}}{R_{ab}}$$

where:

F : weight of retained FMP groundfish (except Pacific hake) recorded on fish tickets

$adj(D_s)$: adjusted discard estimate for species s

Estimated discard amounts for each salmon species in the 2009 limited entry bottom trawl fishery are reported in Table 3.

Nearshore Fixed Gear Groundfish Fishery

Fleet-wide discard estimates for the commercial nearshore fixed gear groundfish fishery were derived from WCGOP data and fish ticket landings data. Fish ticket data were assigned to this sector using the classification system outlined in Figure 1 and included only those fish tickets with recorded nearshore species weight. A list of nearshore species and associated species groups used in this analysis are found in Appendix B.

The WCGOP provides coverage for the commercial nearshore fisheries in California and Oregon based on a selection process of state-issued nearshore permits/licenses. The state of Washington does not allow commercial fishing within state waters. State regulations in California and Oregon have extended the

authority of the WCGOP to require that observers be carried by vessels participating in these state nearshore fisheries. Summaries of observer data for the 2009 nearshore fixed gear groundfish sector are available in a WCGOP data report published in October 2010 (NWFSC 2010b).

Table 4 presents the nearshore species landed weight used as the multiplier to expand observer discard ratios to the fleet-wide level. Discard ratios were calculated by dividing the observed discard (in numbers of individual salmon) by the observed retained weight of nearshore species (Appendix B). Discard estimates were computed for each sector as a product of discard ratios and the total fish ticket landed weight of nearshore species using the following equation:

$$\hat{D}_s = \frac{\sum_t d_{st}}{\sum_t r_t} \times F$$

where:

- s : species or species group
- t : observed sets
- d : observed discard (number) of salmon species s
- r : observed retained weight of nearshore species
- F : weight of retained nearshore species recorded on fish tickets
- D : discard estimate for species s

All salmon bycatch records from the 2009 nearshore fixed gear groundfish fishery were observed in the Oregon state nearshore fishery (2 chinook; 6 coho) and in Oregon waters. In addition, Oregon nearshore vessels landed all their catch in Oregon ports. Therefore, data from the entire state of Oregon was used in both the observed discard ratio denominator and fish ticket expansion factor (of retained nearshore species). Table 4 presents the total landings of nearshore species in Oregon, along with the total number of observed trips, sets, and vessels in the 2009 nearshore fishery that delivered catch to Oregon ports. At the bottom of Table 4, we present the total number of salmon observed, the discard ratio, and estimated fleet-wide chinook and coho salmon bycatch in the 2009 nearshore fixed gear groundfish fishery.

Salmon estimates from the Oregon nearshore fixed gear groundfish fishery partially overlap two latitudinal strata used in salmon bycatch reporting, one of which crosses the Oregon-California border (Cape Blanco OR to Cape Mendocino, CA); and another which does not encompass Oregon waters north of Cape Blanco, OR to the Washington-Oregon border (Cape Falcon to Cape Blanco, OR). Final discard estimates in Table 5 were reported to reflect nearshore fixed gear salmon bycatch in both areas (Cape Falcon to Cape Blanco, OR; Cape Blanco, OR to Cape Mendocino, CA), although estimates were calculated for the Oregon state nearshore fishery only.

Biological Data Collection

For protected resources, including any species regulated under the Endangered Species Act (ESA), additional types of biological data are collected whenever possible. For salmon, observers record length and sex for all individuals, as well as record weight, note presence or absence of an adipose fin, and collect scales, snouts and pectoral fin clips. Snouts are collected for determination of the presence or absence of coded-wire tags (CWT). CWT data is delivered to a regional database, the Regional Mark Information System (RMIS)

(<http://www.rmhc.org>). CWT data was recently used in a study of the marine distribution of chinook salmon in the Pacific Ocean (Weitkamp 2010).

Pectoral fin clip samples are used for genetic mixed stock analysis (also known as “genetic stock identification”) to estimate Chinook salmon stock composition and to better understand the stock-specific, spatial, and temporal distribution of bycatch. Results from genetic mixed stock analysis of 2008 WCGOP and A-SHOP salmon bycatch were provided in a report to the Northwest Regional Office (Moran et al. 2009). Most of the Chinook salmon collected by WCGOP came from the Klamath River with a smaller fraction coming from the Oregon and California coastal populations. Those three stocks accounted for more than 70% of the WCGOP samples in 2008. Analysis of 2009 samples is currently in progress. WCGOP provided 37 fin clips from 2008 sampling and 51 fin clips from 2009 sampling to the Genetic and Evolution Laboratory at the NWFSC.

Results

Salmon discard was estimated for all fisheries observed by the WCGOP in which salmon were reported for the 2009 calendar year. These included the LE bottom trawl fishery and the Oregon nearshore fixed gear fishery (Table 5). A summary of estimated salmon bycatch (number of fish) for four distinct areas from the 2009 West Coast groundfish fisheries is provided in Table 6, along with salmon bycatch values for the various sectors of the 2009 Pacific hake mid-water trawl fishery. Bycatch values from the Pacific hake fishery are those presented by the Northwest Regional Office in the 2009 season summary (NWR 2009).

Annual coastwide estimates of salmon bycatch from 2005 through 2009 are compiled in Table 7 for groundfish fishery sectors observed by the West Coast Groundfish Observer Program (Bellman et al. 2010, Heery et al. 2009, Bellman and Hastie 2008). The salmon estimates from each of these reports for the non-hake fishery sectors were based on the methods described above, in use since 2005. Salmon bycatch from the at-sea and shoreside Pacific hake sectors of the groundfish fishery were compiled from annual summary reports by the NWR (available at: <http://www.nwr.noaa.gov/Groundfish-Halibut/Groundfish-Fishery-Management/Whiting-Management/Index.cfm>). Estimates of salmon bycatch by species were not available for the Pacific hake sectors prior to 2007, except for chinook salmon. The 2005 chinook bycatch estimate is limited to non-tribal motherships and catcher/processors only.

The largest bycatch of chinook salmon in 2009 non-hake groundfish sectors was estimated in the limited entry bottom trawl fishery (Table 5). North of Cape Mendocino, in the limited entry bottom trawl and the nearshore fixed gear fisheries combined, estimated bycatch of chinook salmon was smaller than 2008 by 57 individuals. This continued the decreasing trend in chinook bycatch in this area. Estimates for chinook bycatch north of Cape Mendocino from 2007 through 2009 remained considerably lower than in 2005 (total estimate = 795 individuals; Bellman and Hastie 2008). In the past three years, trawl fisheries south of Cape Mendocino have had fairly consistent chinook bycatch estimates of around 50 individuals (2009 – 50; 2008 – 57; 2007 – 47).

Coho salmon bycatch was estimated to be higher than in previous years, although it was limited to bycatch in the fixed gear nearshore groundfish fishery (Table 4). In the areas north of Cape Mendocino, coho salmon bycatch in 2009 was estimated at 88 individuals (Table 5). This is an increasing trend, as the 2008 total estimate was 39 individuals and the 2007 estimate was 23 individuals (Table 7). No observations of coho

bycatch were made south of Cape Mendocino, except an estimate of 19 individuals in the 2006 limited entry trawl fishery (Bellman and Hastie 2008).

Pink salmon bycatch was first observed in the limited entry bottom trawl fishery during 2009. One individual pink salmon was observed during the summer season in depths shallower than 125 fathoms south of Cape Mendocino, California. Chum and sockeye salmon **were** not observed as bycatch in the 2009 groundfish fisheries.

While point estimates presented in this report can provide an approximation of annual trends in salmon bycatch, they are not intended to reflect exact numbers for West coast groundfish fleets. We recognize that point estimates fluctuate due to a number of non-biological factors, including random annual variation in observer coverage rates, fishing behavior, etc. In addition, we anticipate that several sources of uncertainty, which were not accounted for in this analysis, could influence salmon bycatch estimates. These include uncertainty in logbook spatial and depth information, fish ticket landings, as well as others. Currently, it is not possible to quantify uncertainty for the salmon bycatch estimates presented in this report, as measures of the variability associated with various data sources are not available. As with all point estimates, salmon bycatch values presented here should be considered with caution.

Table 8 summarizes salmon biological data collected by WCGOP observers by fishery sector, from September 2003 through April 2010. Across all years, observers sampled a total of 741 chinook salmon, 20 coho salmon, 2 chum salmon, 1 pink salmon, and 3 unidentified salmon. Biological data for salmon have previously been summarized in WCGOP data reports for each fishery, which are available at: <http://www.nwfsc.noaa.gov/research/divisions/fram/observer/datareport/index.cfm>.

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References

Bellman, M. and J. Hastie. 2008. Observed and estimated total bycatch of salmon in the 2005-2006 west coast limited entry bottom trawl groundfish fishery. Northwest Fisheries Science Center, 2725 Montlake Blvd E, Seattle, WA. Available at www.nwfsc.noaa.gov/research/divisions/fram/documents/SalmonBycatchReport0506_Final.pdf

Bellman, M.A., E. Heery, and J. Majewski. 2010. Observed and estimated total bycatch of salmon in the 2008 U.S. west coast groundfish fisheries. West Coast Groundfish Observer Program. Northwest Fisheries Science Center, 2725 Montlake Blvd E, Seattle, WA. Available at www.nwfsc.noaa.gov/research/divisions/fram/observer/datareport/docs/salmon_mortality_2008.pdf

Heery, E., M.A. Bellman, and J. Hastie. 2009. Observed and estimated total bycatch of salmon in the 2007 U.S. west coast groundfish fisheries. West Coast Groundfish Observer Program. Northwest Fisheries Science Center, 2725 Montlake Blvd E, Seattle, WA. Available at www.nwfsc.noaa.gov/research/divisions/fram/

observer/datareport/docs/salmon_mortality_2007.pdf

Moran, P., E. Iwamoto, R. Shama, and V. Tuttle. 2009. Chinook salmon bycatch stock composition estimates in the 2008 Pacific hake fishery. 23 p. Report to the Northwest Regional Office, NOAA Fisheries. Available from the Northwest Fisheries Science Center, Seattle, Washington.

Northwest Fisheries Science Center (NWFSC). 2006. Observer coverage plan: Sampling plan and logistics for the west coast groundfish observer program. NOAA, West Coast Groundfish Observer Program. Northwest Fisheries Science Center, 2725 Montlake Blvd E, Seattle, WA. Available at www.nwfsc.noaa.gov/research/divisions/fram/observer/observersamplingplan.pdf

Northwest Fisheries Science Center (NWFSC). 2009. West coast groundfish observer training manual. NOAA, West Coast Groundfish Observer Program. Northwest Fisheries Science Center, 2725 Montlake Blvd E, Seattle, WA. Available at www.nwfsc.noaa.gov/research/divisions/fram/observer/observermanual/observermanual.cfm

Northwest Fisheries Science Center (NWFSC). 2010a. Data report and summary analyses of the U.S. West coast limited entry groundfish bottom trawl fishery. West Coast Groundfish Observer Program. National Marine Fisheries Service, NWFSC, 2725 Montlake Blvd E, Seattle, WA. Available at www.nwfsc.noaa.gov/research/divisions/fram/observer/datareport/docs/trawl_report_2010.pdf

Northwest Fisheries Science Center (NWFSC). 2010b. Data report and summary analyses of the U.S. West coast nearshore fixed gear groundfish fishery. West Coast Groundfish Observer Program. National Marine Fisheries Service, NWFSC, 2725 Montlake Blvd E, Seattle, WA. Available at www.nwfsc.noaa.gov/research/divisions/fram/observer/datareport/docs/nearshorefg_report_2010.pdf

Northwest Regional Office (NWR). 2009. Pacific whiting fishery summary, all sectors, 2009. Northwest Regional Office, 7600 Sand Point Way NE, Seattle, WA. Available at www.nwr.noaa.gov/Groundfish-Halibut/Groundfish-Fishery-Management/Whiting-Management/2009/index.cfm.

Pacific Fishery Management Council (PFMC). 2008. Pacific Coast Groundfish Fishery Management Plan. PFMC, 7700 NE Ambassador Place, Suite 100, Portland, OR. Available at www.pfcouncil.org/wp-content/uploads/fmpthru19.pdf

Weitkamp, L.A. 2010. Marine distributions of chinook salmon from the west coast of North America determined by coded wire tag recoveries. *Transactions of the American Fisheries Society* 139: 147-170.

Figures

Figure 1. Fish ticket and logbook data processing for division into groundfish fishery sectors after retrieval of a full calendar year data set from the Pacific Coast Fisheries Information Network (PacFIN) database. Grey highlight indicates sectors for which federal observer data is available.

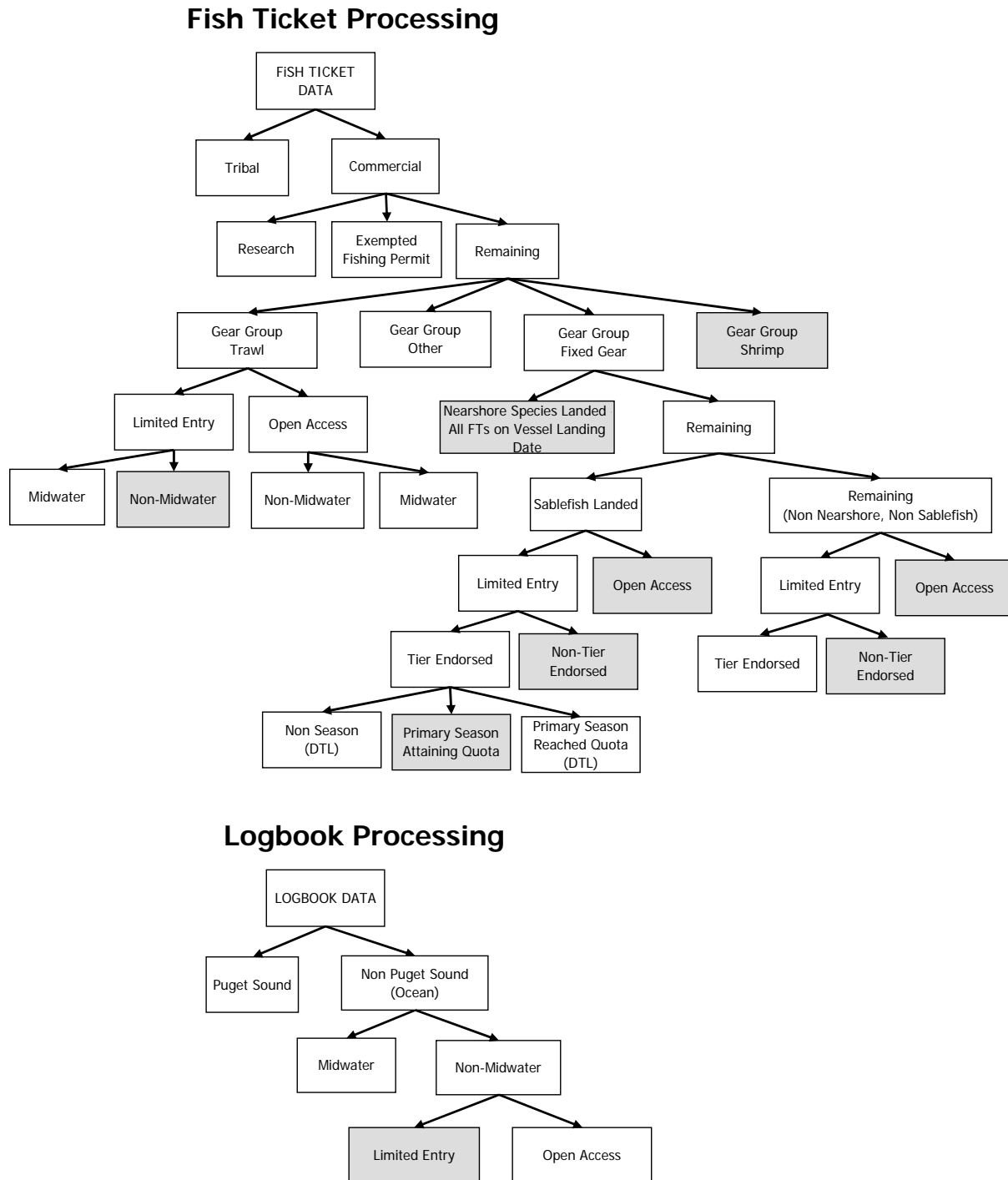
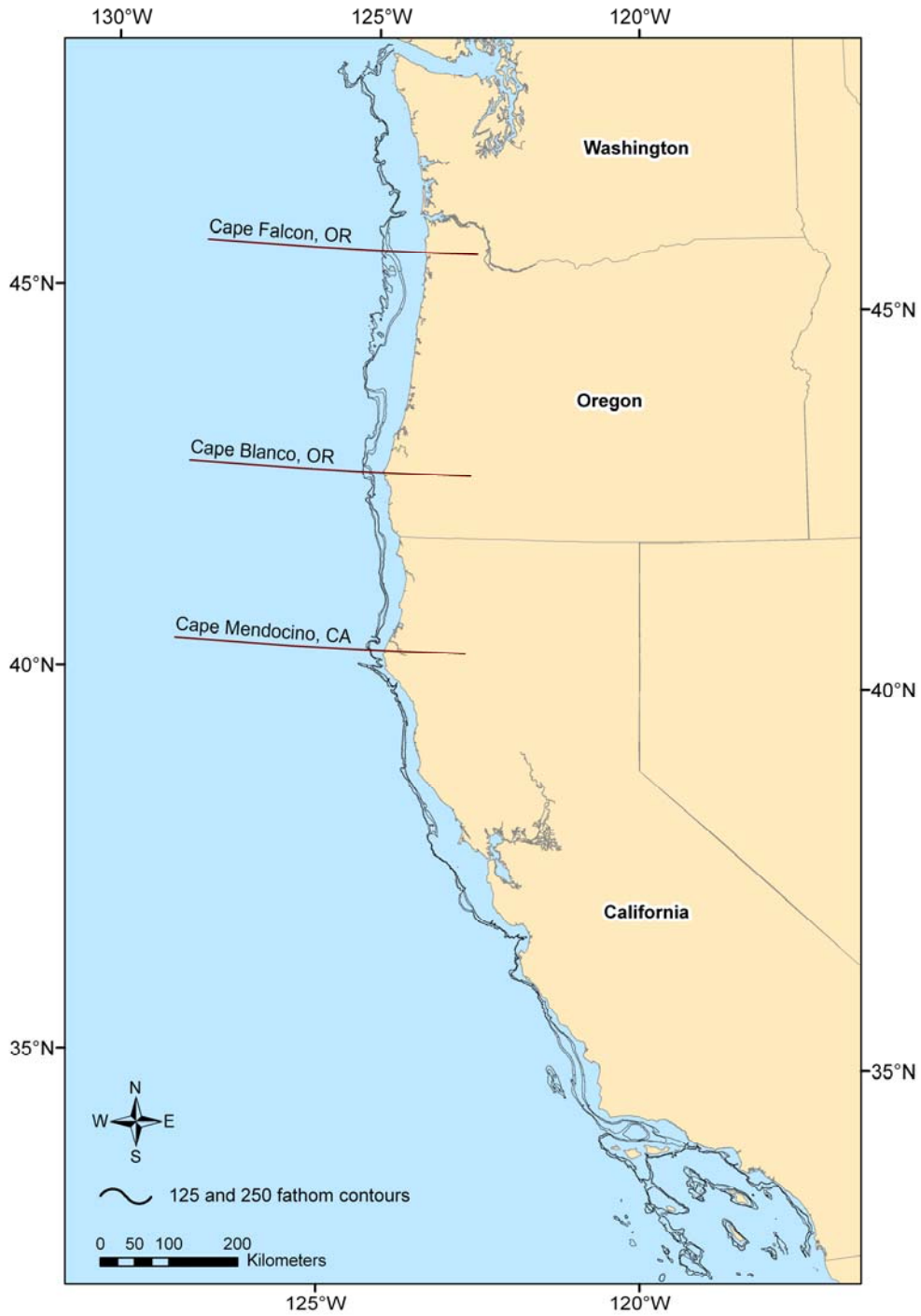


Figure 2. Geographic latitudinal regions and depths utilized in salmon bycatch estimation in the limited entry bottom trawl groundfish fishery. Latitudinal regions are also used to summarize salmon bycatch estimates in the U.S. west coast groundfish fisheries.



Tables

Table 1. Number of tows and retained weight (mt) of FMP groundfish species (excluding Pacific hake) from observer and logbook data for the 2009 limited entry bottom trawl fishery by management area, depth (fathoms), and season. Data are combined as needed to ensure adequate sample size. Tows targeting California halibut have been removed from both observer and logbook data. Winter season is January-April and November-December and summer season is May-October.

	Number of tows							Retained groundfish (mt)					
	Observed fleet		All trawl logbooks		Percentage observed			Observed fleet		All trawl logbooks		Percentage observed	
	Winter	Summer	Winter	Summer	Winter	Summer		Winter	Summer	Winter	Summer	Winter	Summer
North of Cape Falcon							North of Cape Falcon						
0-125	77	663	285	2196	27%	30%	0-125	41	517	132	1764	31%	29%
125-250	215	139	910	959	24%	14%	125-250	576	317	2422	1865	24%	17%
> 250	312	235	1324	1065	24%	22%	> 250	616	282	2439	1131	25%	25%
Total	604	1037	2519	4220	24%	25%	Total	1233	1116	4994	4760	25%	23%
Cape Falcon - Cape Blanco							Cape Falcon - Cape Blanco						
0-125	275	313	275	1332	27%	23%	0-125	388	193	1576	835	25%	23%
125-250		254		981		26%	125-250		333		1241		27%
> 250	476	297	1681	1159	28%	26%	> 250	784	405	2923	1459	27%	28%
Total	751	864	1956	3472	38%	25%	Total	1172	932	4499	3535	26%	26%
Cape Blanco - Cape Mendocino							Cape Blanco - Cape Mendocino						
0-125	0	105	63	674	0%	16%	0-125	0	135	14	1060	0%	13%
125-250	58		351		17%		125-250	94		623		15%	
> 250	215	181	789	947	27%	19%	> 250	392	354	1506	1801	26%	20%
Total	273	286	1203	1621	23%	18%	Total	486	488	2144	2861	23%	17%
South of Cape Mendocino							South of Cape Mendocino						
0-125	71	156	586	629	12%	25%	0-125	70	79	527	175	13%	45%
125-250		105		381		28%	125-250		142		442		32%
> 250	114	120	442	535	26%	22%	> 250	155	172	585	762	27%	23%
Total	185	381	1028	1545	18%	25%	Total	225	392	1112	1379	20%	28%

Table 2. Number of observed individual fish and observed discard ratios for chinook and pink salmon in the limited entry bottom trawl fishery in 2009. Discard ratios were computed as the observed number of individual fish divided by the observed weight (mt) of FMP groundfish (except Pacific hake) in each area, season and depth strata (fathoms). Columns with darker shading signify that data were combined across more than one depth strata.

			Number observed			Discard ratio*		
			0-125	126-250	>250	0-125	126-250	>250
Chinook salmon								
North of Cape Falcon	winter		39	2	0	0.948	0.003	0.000
	summer		0	0	0	0.000	0.000	0.000
Cape Falcon - Cape Blanco	winter		0	15	0		0.039	0.000
	summer		0	0	0	0.000	0.000	0.000
Cape Blanco - Cape Mendocino	winter		--	5	2	--	0.053	0.005
	summer		0	0	0		0.000	0.000
South of Cape Mendocino	winter		0	1	0		0.014	0.000
	summer		18	0	0	0.228	0.000	0.000
Pink salmon								
North of Cape Falcon	winter		0	0	0	0.000	0.000	0.000
	summer		0	0	0	0.000	0.000	0.000
Cape Falcon - Cape Blanco	winter		0	0	0		0.000	0.000
	summer		0	0	0	0.000	0.000	0.000
Cape Blanco - Cape Mendocino	winter		--	0	0	--	0.000	0.000
	summer		0	0	0		0.000	0.000
South of Cape Mendocino	winter		0	0	0		0.000	0.000
	summer		1	0	0	0.013	0.000	0.000

* Discard ratio is defined as the number of individual fish per metric ton of retained groundfish.

Note: Number observed and discard ratios are shown as (--) when there were no observed trips in that strata.

Table 3. Estimated catch (number of fish) of chinook and pink salmon in the 2009 limited entry groundfish bottom trawl fishery by area, season, and depth strata (fathoms). Columns with darker shading signify that data were combined across more than one depth strata.

			Estimated catch (number of fish)			
			0-125	126-250	>250	Total
Chinook salmon						
North of Cape Falcon	winter		133	8	0	141
	summer		0	0	0	0
Cape Falcon - Cape Blanco	winter		0	62	0	62
	summer		0	0	0	0
Cape Blanco - Cape Mendocino	winter		--	35	8	43
	summer		0	0	0	0
South of Cape Mendocino	winter		0	8	0	8
	summer		42	0	0	42
Pink salmon						
North of Cape Falcon	winter		0	0	0	0
	summer		0	0	0	0
Cape Falcon - Cape Blanco	winter		0	0	0	0
	summer		0	0	0	0
Cape Blanco - Cape Mendocino	winter		--	0	0	0
	summer		0	0	0	0
South of Cape Mendocino	winter		0	0	0	0
	summer		2	0	0	2

Table 4. Total landings (mt) of nearshore species (see Appendix C) and the number of observed trips, sets and vessels in the 2009 Oregon nearshore fixed gear fishery. The number of observed chinook and coho is provided along with a discard ratio and estimated fleet-wide bycatch. The discard ratio was computed as the number of individual fish observed divided by the observed landings of nearshore species (mt) in Oregon.

	Oregon nearshore fixed-gear fishery
Expansion factor	
Total fleet landings of nearshore species in Oregon	224.4
Number of observed trips	150
Number of observed sets	219
Number of observed vessels	45
Chinook salmon	
Number of individuals observed	2
Discard ratio	0.1313
Estimated catch (numbers)	29
Coho salmon	
Number of individuals observed	6
Discard ratio	0.3938
Estimated catch (numbers)	88

Table 5. Estimated catch (number of fish) of chinook, pink, and coho salmon in the 2009 West Coast groundfish fisheries. Nearshore fixed gear estimates in 2009 were calculated for the Oregon nearshore fixed gear fishery only, which encompasses two latitudinal reporting strata (Cape Falcon, OR to Cape Blanco, OR; and Cape Blanco, OR to Cape Mendocino, CA).

	LE Trawl	Nearshore fixed gear	TOTAL
Chinook			
North of Cape Falcon	141	--	141
Cape Falcon - Cape Blanco	62	29	134
Cape Blanco - Cape Mendocino	43	--	43
South of Cape Mendocino	50	--	50
Coastwide	296	29	325
Pink			
North of Cape Falcon	--	--	0
Cape Falcon - Cape Blanco	--	--	0
Cape Blanco - Cape Mendocino	--	--	0
South of Cape Mendocino	2	--	2
Coastwide	2	0	2
Coho			
North of Cape Falcon	--	--	0
Cape Falcon - Cape Blanco	--	88	88
Cape Blanco - Cape Mendocino	--	--	0
South of Cape Mendocino	--	--	0
Coastwide	0	88	88

Table 6. Coast-wide estimated salmon bycatch in all 2009 groundfish fishery sectors which were observed by the West Coast Groundfish Observer Program (above), as well as at-sea and shoreside Pacific hake sectors (below). Estimates from the Pacific hake fishery were provided in the annual summary report by the Northwest Regional Office.

	Salmon Species				
	Chinook	Coho	Chum	Pink	Sockeye
2009 Non-hake fishery sectors					
LE groundfish bottom trawl	296	0	0	2	0
California halibut trawl (LE/OA)	0	0	0	0	0
Pink shrimp trawl (OA)	0	0	0	0	0
LE sablefish primary	0	0	0	0	0
LE sablefish non-primary	0	0	0	0	0
OA non-nearshore fixed gear	0	0	0	0	0
Nearshore fixed gear	29	88	0	0	0
Total	325	88	0	2	0
2009 Hake fishery sectors					
Tribal - Mothership	821	8	11	0	0
Tribal - Shoreside	1321	49	0	129	0
Mothership	269	12	41	2	0
Catcher/Processors	22	0	0	0	0
Shorebased (EFP)	279	37	2	26	0
Total	2712	106	54	157	0
Total (all sectors)	3037	194	54	159	0

Table 7. Annual coastwide estimated salmon bycatch from 2005 through 2009, in all groundfish fishery sectors observed by the West Coast Groundfish Observer Program (above) (Bellman et al. 2010, Heery et al. 2009, Bellman and Hastie 2008). Estimates from the at-sea and shoreside Pacific hake sectors (below) were compiled from annual summary reports by the Northwest Regional Office.

	Salmon Species				
	Chinook	Coho	Chum	Pink	Sockeye
Non-hake fishery sectors					
2009	325	88	0	2	0
2008	389	39	0	0	0
2007	234	23	0	0	0
*2006	96	19	0	0	0
*2005	799	5	0	0	0
Pacific hake fishery sectors					
2009	2712	106	54	157	0
2008	3380	52	79	16	2
2007	6186	475	291	595	0
2006	3975				
2005	**3960				

*Bycatch estimates in 2005 and 2006 were from the limited entry bottom trawl sector only.

**Non-tribal motherships and catcher/processors only.

Table 8. Summary of biological data for salmon species collected by WCGOP observers from September 2003 through April 2010 by fishery sector. The number of length measurements and the number of individuals sexed is reported for each year where data are available.

Year	# lengths	# sexes
Limited Entry Bottom Trawl		
Chinook salmon		
Sep - Dec 2003	8	8
2004	276	265
2005	118	105
2006	9	9
2007	28	28
2008	54	53
2009	74	72
Jan - Apr 2010	4	2
Chum salmon		
2003	1	0
2004	1	1
Coho salmon		
2004	5	5
2005	1	1
2007	2	1
Jan - Apr 2010	2	1
Pink salmon		
2009	1	0
Unidentified salmon		
2004	3	3
California Halibut Trawl - Limited Entry		
Chinook salmon		
2004	77	77
2005	41	41
2006	14	8
2007	12	11
2008	21	21
Jan - Apr 2010	2	2
Coho salmon		
2006	4	4
Nearshore Fixed Gear		
Chinook salmon		
2004	2	0
2006	1	0
Coho salmon		
2004	2	0
2007	1	0
2009	1	0
Non-Nearshore Fixed Gear		
Coho salmon		
2005	1	1
2007	1	1

Appendix A

Common and scientific names of species included in the Pacific Coast Groundfish Fishery Management Plan, as amended through Amendment 19 (PFMC 2008).

SHARKS

Big skate, *Raja binoculata*
California skate, *R. inornata*
Leopard shark, *Triakis semifasciata*
Longnose skate, *R. rhina*
Soupfin shark, *Galeorhinus gyoferus*
Spiny dogfish, *Squalus acanthias*

RATFISH

Ratfish, *Hydrolagus colliei*

MORIDS

Finescale codling, *Antimora microlepis*

GRENADIERS

Pacific rattail, *Coryphaenoides acrolepis*

ROUNDFISH

Cabezon, *Scorpaenichthys marmoratus*
Kelp greenling, *Hexagrammos decagrammus*
Lingcod, *Ophiodon elongatus*
Pacific cod, *Gadus macrocephalus*
Pacific whiting, (hake) *Merluccius productus*
Sablefish, *Anoplopoma fimbria*

FLATFISH

Arrowtooth flounder, (turbot) *Atheresthes stomias*
Butter sole, *Isopsetta isolepis*
Curlfin sole, *Pleuronichthys decurrens*
Dover sole, *Microstomus pacificus*
English sole, *Parophrys vetulus*
Flathead sole, *Hippoglossoides elassodon*
Pacific sanddab, *Citharichthys sordidus*
Petrale sole, *Eopsetta jordani*
Rex sole, *Glyptocephalus zachirus*
Rock sole, *Lepidopsetta bilineata*
Sand sole, *Psettichthys melanostictus*
Starry flounder, *Platichthys stellatus*

ROCKFISH

Includes all genera and species of the family Scopaenidae, even if not listed, that occur in the Washington, Oregon, and California area. The Scopaenidae genera are *Sebastes*, *Scorpaena*, *Sebastolobus*, and *Scorpaenodes*.

Aurora, *Sebastes aurora*
Bank, *S. rufus*
Black, *S. melanops*
Black-and-yellow, *S. chrysomelas*.
Blackgill, *S. melanostomus*
Blue, *S. mystinus*
Bocaccio, *S. paucispinis*
Bronzespotted, *S. gilli*
Brown, *S. auriculatus*
Calico, *S. dalli*
California scorpionfish, *Scorpaena guttata*
Canary, *Sebastes pinniger*
Chameleon, *S. phillipsi*
Chilipepper, *S. goodei*
China, *S. nebulosus*
Copper, *S. caurinus*
Cowcod, *S. levis*
Darkblotched, *S. crameri*
Dusky, *S. ciliatus*
Dwarf-red, *S. rufianus*
Flag, *S. rubrivinctus*
Freckled, *S. lentiginosus*
Gopher, *S. carnatus*
Grass, *S. rastrelliger*
Greenblotched, *S. rosenblatti*
Greenspotted, *S. chlorostictus*
Greenstriped, *S. elongatus*
Halfbanded, *S. semicinctus*
Harlequin, *S. variegatus*
Honeycomb, *S. umbrosus*
Kelp, *S. atrovirens*
Longspine thornyhead, *Sebastolobus altivelis*
Mexican, *Sebastes macdonaldi*
Olive, *S. serranoides*
Pink, *S. eos*
Pinkrose, *S. simulator*
Pygmy, *S. wilsoni*
Pacific ocean perch, *S. alutus*
Quillback, *S. maliger*
Redbanded, *S. babcocki*
Redstripe, *S. proriger*

Rosethorn, *S. helvomaculatus*
Rosy, *S. rosaceus*
Rougheye, *S. alentianus*
Sharpchin, *S. zacentrus*
Shortbelly, *S. jordani*
Shortraker, *S. borealis*
Shortspine thornyhead, *Sebastolobus alascanus*
Silvergray, *Sebastes brevispinus*
Speckled, *S. ovalis*
Splitnose rockfish, *S. diploproa*
Squarespot, *S. hopkinsi*
Starry, *S. constellatus*
Stripetail, *S. saxicola*
Swordspine, *S. ensifer*
Tiger, *S. nigrocinctus*
Treefish, *S. serriceps*
Vermilion, *S. miniatus*
Widow, *S. entomelas*
Yelloweye, *S. ruberrimus*
Yellowmouth, *S. reedi*
Yellowtail, *S. flavidus*

Appendix B

Species identification codes used in the Pacific Coast Fisheries Information Network (PacFIN) database and assigned to WCGOP observer data. Columns on the far right specify which species were included in discard ratio denominators and expansion factors as groundfish, as identified in the Pacific Coast Groundfish Fishery Management Plan, or as nearshore species.

PacFIN Species ID	PacFIN Common Name	FMP Groundfish	NS Species
ALBC	ALBACORE		
AKSK	ALASKA SKATE		
AMCK	ATKA MACKEREL		
APLC	ALASKA PLAICE		
ARR1	NOM. AURORA ROCKFISH	yes	
ARRA	AURORA ROCKFISH	yes	
ART1	NOM. ARROWTOOTH FLOUNDER	yes	
ARTH	ARROWTOOTH FLOUNDER	yes	
ASKT	ALEUTIAN SKATE		
ASRK	PACIFIC ANGEL SHARK		
BABL	BLACK ABALONE		
BANK	BANK ROCKFISH	yes	
BCAC	BOCACCIO	yes	
BCC1	NOM. BOCACCIO	yes	
BCLM	BUTTER CLAM		
BGL1	NOM. BLACKGILL ROCKFISH	yes	
BHAG	BLACK HAGFISH		
BISC	BROWN IRISH LORD		yes
BKCR	BLUE KING CRAB		
BLCK	BLACK ROCKFISH	yes	yes
BLGL	BLACKGILL ROCKFISH	yes	
BLK1	NOM. BLACK ROCKFISH	yes	yes
BLPT	BLACK EELPOUT		
BLSK	BLACK SKATE		
BLU1	NOM. BLUE ROCKFISH	yes	yes
BLUR	BLUE ROCKFISH	yes	yes
BMCK	BULLET MACKEREL		
BMRL	BLUE MARLIN		
BMSL	BLUE OR BAY MUSSEL		
BNK1	NOM. BANK ROCKFISH	yes	
BRNZ	BRONZESPOTTED ROCKFISH	yes	
BRW1	NOM. BROWN ROCKFISH	yes	yes
BRWN	BROWN ROCKFISH	yes	yes
BRZ1	NOM. BRONZESPOTTED ROCKFISH	yes	
BSCL	BUFFALO SCULPIN		yes
BSJK	BLACK SKIPJACK		
BSKT	BIG SKATE	yes	
BSOL	BUTTER SOLE	yes	

PacFIN Species ID	PacFIN Common Name	FMP Groundfish	NS Species
BSRK	BLUE SHARK		
BSRM	UNSP. BAIT SHRIMP		
BTCR	BAIRDI TANNER CRAB		
BTNA	BLUEFIN TUNA		
BTRY	BAT RAY		
BYEL	BLACK-AND-YELLOW ROCKFISH	yes	yes
BYL1	NOM. BLACK-AND-YELLOW ROCKFISH	yes	yes
CBZ1	NOM. CABEZON	yes	yes
CBZN	CABEZON	yes	yes
CEEL	SPOTTED CUSK-EEL		
CHL1	NOM. CALIFORNIA HALIBUT		
CHLB	CALIFORNIA HALIBUT		
CHN1	NOM. CHINA ROCKFISH	yes	yes
CHNA	CHINA ROCKFISH	yes	yes
CHNK	CHINOOK SALMON		
CHUM	CHUM SALMON		
CKLE	BASKET COCKLE		
CLC1	NOM. CALICO ROCKFISH	yes	yes
CLCO	CALICO ROCKFISH	yes	yes
CLP1	NOM. CHILIPEPPER	yes	
CLPR	CHILIPEPPER	yes	
CMCK	CHUB MACKEREL		
CMEL	CHAMELEON ROCKFISH	yes	
CML1	NOM. CHAMELEON ROCKFISH	yes	
CMSL	CALIFORNIA MUSSEL		
CNR1	NOM. CANARY ROCKFISH	yes	
CNRY	CANARY ROCKFISH	yes	
COHO	COHO SALMON		
COP1	NOM. COPPER ROCKFISH	yes	yes
COPP	COPPER ROCKFISH	yes	yes
CPLN	CAPELIN		
CSKT	CALIFORNIA SKATE	yes	
CSL1	NOM. CURLFIN SOLE	yes	
CSLK	CALIFORNIA SLICKHEAD		
CSRK	BROWN CAT SHARK		
CSOL	CURLFIN SOLE	yes	
CTRB	C-O SOLE		
CUDA	PACIFIC BARRACUDA		
CWC1	NOM. COWCOD ROCKFISH	yes	
CWCD	COWCOD ROCKFISH	yes	
DARK	DARK ROCKFISH	yes	
DBR1	NOM. DARKBLOTCHED ROCKFISH	yes	
DBRK	DARKBLOTCHED ROCKFISH	yes	
DCRB	DUNGENESS CRAB		
DFLT	UNSP. DEEP FLOUNDERS	yes	
DOVR	DOVER SOLE	yes	

PacFIN Species ID	PacFIN Common Name	FMP Groundfish	NS Species
DRDO	DORADO		
DSOL	DEESEA SOLE		
DSRK	SPINY DOGFISH	yes	
DTRB	DIAMOND TURBOT		
DUSK	DUSKY ROCKFISH	yes	
DVR1	NOM. DOVER SOLE	yes	
DWRF	DWARF-RED ROCKFISH	yes	
EELS	UNSPECIFIED EELS		
EGL1	NOM. ENGLISH SOLE	yes	
EGLS	ENGLISH SOLE	yes	
ESTR	EASTERN OYSTER		
ETNA	BIGEYE TUNA		
EULC	EULACHON		
EURO	EUROPEAN OYSTER		
FLAG	FLAG ROCKFISH	yes	
FLG1	NOM. FLAG ROCKFISH	yes	
FNTS	FANTAIL SOLE		
FRCK	FRECKLED ROCKFISH	yes	
FSOL	FLATHEAD SOLE	yes	
GABL	GREEN ABALONE		
GBAS	GIANT SEA BASS		
GBL1	NOM. GREENBLOTCHED ROCKFISH	yes	
GBLC	GREENBLOTCHED ROCKFISH	yes	
GCLM	GAPER CLAM		
GDUK	GEODUCK		
GGRD	GIANT GRENADIER		
GKCR	GOLDEN KING CRAB		
GPH1	NOM. GOPHER ROCKFISH	yes	yes
GPHR	GOPHER ROCKFISH	yes	yes
GPRW	GOLDEN PRAWN		
GRAS	GRASS ROCKFISH	yes	yes
GRDR	UNSP. GRENADIERS	yes	
GREN	PACIFIC GRENADIER	yes	
GRS1	NOM. GRASS ROCKFISH	yes	yes
GSP1	NOM. GREENSPOTTED ROCKFISH	yes	
GSPT	GREENSPOTTED ROCKFISH	yes	
GSQD	GIANT SQUID		
GSR1	NOM. GREENSTRIPED ROCKFISH	yes	
GSRK	GREENSTRIPED ROCKFISH	yes	
GSRM	GHOST SHRIMP		
GSTG	GREEN STURGEON		
GTRB	GREENLAND TURBOT		
HBRK	HALFBANDED ROCKFISH	yes	
HCLM	HORSE CLAMS		
HLQN	HARLEQUIN ROCKFISH	yes	
HNY1	NOM. HONEYCOMB ROCKFISH	yes	

PacFIN Species ID	PacFIN Common Name	FMP Groundfish	NS Species
HNYC	HONEYCOMB ROCKFISH	yes	
HTRB	HORNYHEAD TURBOT		
ISRK	BIGEYE THRESHER SHARK		
JCLM	CALIFORNIA JACKKNIFE CLAM		
JMCK	JACK MACKEREL		
KFSH	GIANT KELPFISH		
KGL1	NOM. KELP GREENLING	yes	yes
KLP1	NOM. KELP ROCKFISH	yes	yes
KLPG	KELP GREENLING	yes	yes
KLPR	KELP ROCKFISH	yes	yes
KMKA	KAMCHATKA FLOUNDER		
KSTR	KUMAMOTO OYSTER		
LCD1	NOM. LINGCOD	yes	yes
LCLM	NATIVE LITTLENECK		
LCOD	LINGCOD	yes	yes
LDAB	LONGFIN SANDDAB		
LDB1	NOM. LONGFIN SANDDAB		
LOBS	CALIF. SPINY LOBSTER		
LSKT	LONGNOSE SKATE	yes	
LSP1	NOM. LONGSPINE THORNYHEAD	yes	
LSPN	LONGSPINE THORNYHEAD	yes	
LSRK	LEOPARD SHARK	yes	
LSTR	OLYMPIA OYSTER		
LUVR	LOUVAR		
MACL	MUD CLAMS		
MAKO	SHORTFIN MAKO SHARK		
MCLM	MANILA CLAM		
MEEL	MONKEYFACE EEL		
MISC	MISC. FISH/ANIMALS		
MOLA	COMMON MOLA		
MRLN	STRIPED MARLIN		
MSC2	MISCELLANEOUS FISH		
MSHP	PLAINFIN MIDSHIPMAN		
MSQD	MARKET SQUID		
MSRM	MUD SHRIMP		
MXR1	NOM. MEXICAN ROCKFISH	yes	
MXRF	MEXICAN ROCKFISH	yes	
NANC	NORTHERN ANCHOVY		
NRCK	NORTHERN ROCKFISH	yes	
NSHR	NORTHERN NEAR-SHORE ROCKFISH	yes	yes
NSLF	NORTHERN SHELF ROCKFISH	yes	
NSLP	NORTHERN SLOPE ROCKFISH	yes	
NUSF	NOR. UNSP. SHELF ROCKFISH	yes	
NUSP	NOR. UNSP. SLOPE ROCKFISH	yes	
NUSR	NOR. UNSP. NEAR-SHORE ROCKFISH	yes	yes
OABL	OTHER ABALONE		

PacFIN Species ID	PacFIN Common Name	FMP Groundfish	NS Species
OANC	OTHER ANCHOVY		
OBAS	OTHER BASS		
OCLM	OTHER CLAM		
OCRB	OTHER CRAB		
OCRK	OTHER CROAKER		
OCTP	UNSP. OCTOPUS		
ODSR	OTHER DEMERSAL RKFSH	yes	
OECH	OTHER ECHINODERM		
OFLT	OTHER FLATFISH	yes	
OGRN	OTHER GROUND FISH	yes	
OLV1	NOM. OLIVE ROCKFISH	yes	yes
OLVE	OLIVE ROCKFISH	yes	yes
OMSK	OTHER MOLLUSKS		
OPLG	OTHER PELAGIC RKFSH	yes	
ORCK	OTHER ROCKFISH	yes	
ORND	OTHER ROUND FISH	yes	
OSCL	OTHER SCALLOP		
OSKT	OTHER SKATES	yes	
OSLR	OTHER SLOPE RKFSH	yes	
OSRK	OTHER SHARK		
OSRM	OTHER SHRIMP		
OSTR	OTHER OYSTER		
OTCR	OPILO TANNER CRAB		
OTNA	OTHER TUNA		
OURC	OTHER SEA URCHINS		
OWFS	OCEAN WHITEFISH		
PABL	PINK ABALONE		
PBNT	PACIFIC BONITO		
PBTR	PACIFIC BUTTERFISH		
PCLM	PISMO CLAM		
PCOD	PACIFIC COD	yes	
PDAB	PACIFIC SANDDAB	yes	
PDB1	NOM. PACIFIC SANDDAB	yes	
PFNS	PACIFIC FLATNOSE	yes	
PGMY	PYGMY ROCKFISH	yes	
PHAG	PACIFIC HAGFISH		
PHLB	PACIFIC HALIBUT		
PHRG	PACIFIC HERRING		
PINK	PINK SALMON		
PLCK	WALLEYE POLLOCK	yes	
PNK1	NOM. PINK ROCKFISH	yes	
PNKR	PINK ROCKFISH	yes	
POMF	PACIFIC POMFRET		
POP	PACIFIC OCEAN PERCH	yes	
POP1	GEN. SHELF/SLOPE RF	yes	
POP2	NOMINAL POP	yes	
PRCL	PURPLE CLAM		

PacFIN Species ID	PacFIN Common Name	FMP Groundfish	NS Species
PROW	PROWFISH		
PRR1	NOM. PINKROSE ROCKFISH	yes	
PRRK	PINKROSE ROCKFISH	yes	
PSDN	PACIFIC SARDINE		
PSHP	PINK SHRIMP		
PSRK	PELAGIC THRESHER SHARK		
PSTR	PACIFIC OYSTER		
PTR1	NOM. PETRALE SOLE	yes	
PTRL	PETRALE SOLE	yes	
PUGT	PUGET SOUND ROCKFISH	yes	
PWHT	PACIFIC WHITING	yes	
QCLM	NORTHERN QUAHOG CLAM		
QFSH	QUEENFISH		
QLB1	NOM. QUILLBACK ROCKFISH	yes	yes
QLBK	QUILLBACK ROCKFISH	yes	yes
RABL	RED ABALONE		
RATF	SPOTTED RATFISH	yes	
RCK1	BOCACCIO+CHILIPEPPER RCKFSH	yes	
RCK2	UNSP. BOLINA RCKFSH	yes	yes
RCK3	UNSP. DPWTR REDS RCKFSH	yes	
RCK4	UNSP. REDS RCKFSH	yes	
RCK5	UNSP. SMALL REDS RCKFSH	yes	
RCK6	UNSP. ROSEFISH RCKFSH	yes	
RCK7	UNSP. GOPHER RCKFSH	yes	yes
RCK8	CANARY+VERMILION RCKFSH	yes	
RCK9	BLACK+BLUE ROCKFISH	yes	yes
RCKG	ROCK GREENLING		
RCLM	RAZOR CLAM		
RCRB	ROCK CRAB		
RDB1	NOM. REDBANDED ROCKFISH	yes	
RDBD	REDBANDED ROCKFISH	yes	
REDS	REDSTRIPE ROCKFISH	yes	
REX	REX SOLE	yes	
REX1	NOM. REX SOLE	yes	
REYE	ROUGHEYE ROCKFISH	yes	
RFLT	REMAINING FLATFISH	yes	
RGL1	NOM. ROCK GREENLING		
RGRN	REMAINING GROUND FISH	yes	
RHRG	ROUND HERRING		
RKCR	RED KING CRAB		
ROS1	NOM. ROSY ROCKFISH	yes	
ROSY	ROSY ROCKFISH	yes	
RPRW	RIDGEBACK PRAWN		
RRCK	REMAINING ROCKFISH	yes	
RRND	REMAINING ROUND FISH	yes	
RSCL	RED IRISH LORD		yes

PacFIN Species ID	PacFIN Common Name	FMP Groundfish	NS Species
RSL1	NOM. ROCK SOLE	yes	
RSOL	ROCK SOLE	yes	
RSRM	GRASS SHRIMP		
RST1	NOM. ROSETHORN ROCKFISH	yes	
RSTN	ROSETHORN ROCKFISH	yes	
RURC	RED SEA URCHIN		
RZCL	ROSY RAZOR CLAM		
SABL	SABLEFISH	yes	
SAIL	SAILFISH		
SARY	PACIFIC SAURY		
SBL1	NOM. SHORTBELLY ROCKFISH	yes	
SBLY	SHORTBELLY ROCKFISH	yes	
SCLM	SOFT-SHELLED CLAM		
SCLP	UNSP. SCULPIN		
SCOR	CALIFORNIA SCORPIONFISH	yes	yes
SCR1	NOM. CALIF. SCORPIONFISH	yes	yes
SDB1	NOM. SPECKLED SANDDAB		
SFL1	NOM. STARRY FLOUNDER	yes	
SFLT	UNSP. SHALLOW FLOUNDERS	yes	
SHAD	UNSPECIFIED SHAD		
SHP1	NOM. CALIFORNIA SHEEPHEAD		yes
SHPD	CALIFORNIA SHEEPHEAD		yes
SHRP	SHARPCHIN ROCKFISH	yes	
SKCR	SCARLET KING CRAB		
SLGR	SILVERGREY ROCKFISH	yes	
SLNS	SLENDER SOLE		
SMLT	UNSP. SMELT		
SNOS	SPLITNOSE ROCKFISH	yes	
SNS1	NOM. SPLITNOSE ROCKFISH	yes	
SOCK	SOCKEYE SALMON		
SPK1	NOM. SPECKLED ROCKFISH	yes	
SPKL	SPECKLED ROCKFISH	yes	
SPRW	SPOTTED PRAWN		
SPSK	SANDPAPER SKATE		
SQID	UNSP. SQUID		
SQR1	NOM. SQUARESPOT	yes	
SQRS	SQUARESPOT ROCKFISH	yes	
SRFP	SURFPERCH SPP.		
SRKR	SHORTRAKER ROCKFISH	yes	
SSCL	SHARPNOSE SCULPIN		
SSDB	SPECKLED SANDDAB		
SSHR	SOUTHERN NEAR-SHORE ROCKFISH	yes	yes
SSKT	STARRY SKATE		
SSLF	SOUTHERN SHELF ROCKFISH	yes	
SSLP	SOUTHERN SLOPE ROCKFISH	yes	
SSO1	NOM. SAND SOLE	yes	

PacFIN Species ID	PacFIN Common Name	FMP Groundfish	NS Species
SSOL	SAND SOLE	yes	
SSP1	NOM. SHORTSPINE THORNYHEAD	yes	
SSPF	SHORTBILL SPEARFISH		
SSPN	SHORTSPINE THORNYHEAD	yes	
SSRD	Deep So. Near-shore RF	yes	yes
SSRK	SOUPFIN SHARK	yes	
SSRS	Shallow So. Near-shore RF	yes	yes
STAR	STARRY ROCKFISH	yes	
STL1	NOM. STRIPETAIL ROCKFISH	yes	
STLH	STEELHEAD		
STNA	SKIPJACK TUNA		
STR1	NOM. STARRY ROCKFISH	yes	
STRK	STRIPETAIL ROCKFISH	yes	
STRY	STARRY FLOUNDER	yes	
SUSF	SOU. UNSP. SHELF ROCKFISH	yes	
SUSP	SOU. UNSP. SLOPE ROCKFISH	yes	
SUSR	SOU. UNSP. NEAR-SHORE ROCKFISH	yes	yes
SWRD	SWORDFISH		
SWS1	NOM. SWORDSPINE ROCKFISH	yes	
SWSP	SWORDSPINE ROCKFISH	yes	
TCOD	PACIFIC TOMCOD		
TGR1	NOM. TIGER ROCKFISH	yes	
THD1	NOM. THORNYHEADS	yes	
THDS	THORNYHEADS (MIXED)	yes	
TIGR	TIGER ROCKFISH	yes	
TRE1	NOM. TREEFISH	yes	yes
TREE	TREEFISH	yes	yes
TSRK	COMMON THRESHER SHARK		
UABL	UNSPECIFIED ABALONE		
UCLM	UNSPECIFIED CLAM		
UCRB	UNSPECIFIED CRAB		
UDAB	UNSP. SANDDABS	yes	
UDF1	UNSP. DEEP-91 FLOUNDERS	yes	
UDF2	UNSP. DEEP-95 FLOUNDERS	yes	
UDM1	UNSP. DEMERSAL-91	yes	
UDNR	UNSP. DEEP NEAR-SHORE RF	yes	yes
UDSR	UNSP. DEMERSAL RKFSH	yes	
UDW1	SHORTTRAKER+ROUGHEYE	yes	
UECH	UNSPECIFIED ECHINODERM		
UFL1	FLOUNDERS (NO FSOL)	yes	
UFLT	UNSP. FLATFISH	yes	
UGLG	UNSP. GREENLING		yes
UGRN	UNSP. GROUND FISH	yes	
UHAG	UNSPECIFIED HAGFISH		
UHLB	UNSPECIFIED HALIBUT		
UJEL	UNSP. JELLYFISH		

PacFIN Species ID	PacFIN Common Name	FMP Groundfish	NS Species
UKCR	UNSP. KING CRAB		
UMCK	UNSP. MACKEREL		
UMSK	UNSPECIFIED MOLLUSKS		
UPLG	UNSP. PELAGIC RKFSH	yes	
UPOP	UNSP. POP GROUP	yes	
URCK	UNSP. ROCKFISH	yes	
URK1	SRKR+REYE+NRCK+SHRP	yes	
URND	UNSP. ROUNDFISH	yes	
USCL	UNSPECIFIED SCALLOP		
USCU	UNSP. SEA CUCUMBERS		
USF1	UNSP. SHALLOW-91 FLOUNDERS	yes	
USHR	UNSP. NEAR-SHORE ROCKFISH	yes	yes
USKT	UNSP. SKATE	yes	
USLF	UNSP. SHELF ROCKFISH	yes	
USLP	UNSP. SLOPE ROCKFISH	yes	
USLR	UNSP. SLOPE RKFSH	yes	
USMN	UNSP. SALMON		
USR1	UNSP. SLOPE-91	yes	
USR2	UNSP. SLOPE-93	yes	
USRK	UNSP. SHARK		
USRM	UNSP. OCEAN SHRIMP		
USTG	UNSP. STURGEON		
USTR	UNSPECIFIED OYSTER		
UTCR	UNSP. TANNER CRAB		
UTNA	UNSPECIFIED TUNA		
UTRB	UNSP. TURBOTS	yes	
UURC	UNSP. SEA URCHINS		
VCLM	VARNISH CLAM		
VRM1	NOM. VERMILLION ROCKFISH	yes	
VRML	VERMILION ROCKFISH	yes	
WABL	WHITE ABALONE		
WBAS	WHITE SEABASS		
WCLM	WASHINGTON CLAM		
WCRK	WHITE CROAKER		
WDOW	WIDOW ROCKFISH	yes	
WDW1	NOM. WIDOW ROCKFISH	yes	
WEEL	WOLF EEL		
WHOO	WAHOO		
WSTG	WHITE STURGEON		
YEY1	NOM. YELLOWEYE ROCKFISH	yes	
YEYE	YELLOWEYE ROCKFISH	yes	
YLTL	YELLOWTAIL		
YMTH	YELLOWMOUTH ROCKFISH	yes	
YSOL	YELLOWFIN SOLE		
YTNA	YELLOWFIN TUNA		
YTR1	NOM. YELLOWTAIL ROCKFISH	yes	
YTRK	YELLOWTAIL ROCKFISH	yes	

