Data Report and Summary Analyses of the U.S. West Coast Limited Entry Groundfish Bottom Trawl Fishery

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INTRODUCTION

Overview

This report summarizes discarded catch data collected by the West Coast Groundfish Observer Program (WCGOP) from the limited entry (LE) bottom trawl fishery from January 1, 2008 through April 30, 2009. The WCGOP collects at-sea data from LE trawl and fixed gear fisheries, as well as from nearshore, shrimp, California halibut, and deep-water fisheries. 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 data are used in assessing and managing a variety of groundfish species.

West Coast Limited Entry Groundfish Trawl Fishery

The LE groundfish bottom trawl fishery off the west coast of the United States operates from the Canadian border to Morro Bay, California. Each vessel that participates in the LE groundfish bottom trawl fishery must have a federal groundfish permit with a trawl endorsement. In 2008, there were 179 LE trawl permits of which 10 were associated with factory processors that target Pacific hake and are observed by the At-Sea Hake Observer Program (ASHOP).

Groundfish bottom trawl vessels range in size from 35 to 95 feet, with an average length of 65 feet. Vessels fish throughout the year in a wide range of depths and deliver catch to shoreside processors. Bottom trawlers often target species assemblages, which can result in diverse catch, especially when compared to single species trawl fisheries, such as the midwater trawl fishery for Pacific hake. A single groundfish bottom trawl tow often includes fifteen to twenty species. Fish size and weight of the total catch also vary widely. Groundfish trawl vessels retain the portion of their catch that is marketable and permitted to be landed. The portion of the catch which is prohibited by regulations or not marketable is discarded at-sea.

Regulations for the groundfish bottom trawl fishery are set by the Pacific Fishery Management Council (PFMC). Active management of the fishery began in the early 1980's with the establishment of optimum yields (OY's) for several managed species and trip limits for widow rockfish, the *Sebastes* complex, and sablefish. The objective of trip limits has been to slow the pace of landings to maintain year-round fishing, processing, and marketing opportunities. Since the 1980's, regulations have evolved to further separate individual groundfish species for management purposes and led to the current use of cumulative two-month trip limits for most species (PFMC 2008). Cumulative trip limits are a specified weight of fish that can be landed during a particular time period.

Commercial Groundfish Bottom Trawl Fishery Data

Fisheries managers and enforcement officers use state-issued sales receipts, referred to as fish tickets, and vessel logbooks to monitor landings and fishing behavior in the LE bottom trawl fishery. Fish ticket and vessel logbook data are transferred to the Pacific Coast Fisheries Information Network (PacFIN) regional database system by state fishery agencies in Washington, Oregon, and California. Fish ticket information is uploaded to PacFIN on a monthly basis and is subject to updates frequently thereafter. Fish tickets are trip-aggregated

sales receipts for market species/categories. Trip limit amounts may be changed through in-season management based on the fish ticket data. As fish tickets only provide information on the amount of fish landed, to ensure that total catch does not exceed the annual OY, managers also need discard information for each managed species. One of the best means of acquiring accurate data needed to estimate the amount of discarded catch is through an at-sea observer program.

West Coast Groundfish Observer Program

On May 24, 2001, NOAA Fisheries (National Marine Fisheries Service, NMFS) established the WCGOP in accordance with the Pacific Coast Groundfish Fishery Management Plan (50 CFR Part 660) (66 FR 20609). This regulation requires all vessels that catch groundfish in the United States Exclusive Economic Zone (EEZ) from 3-200 miles offshore to carry an observer when notified to do so by NMFS or its designated agent. Subsequent state rule-making has extended NMFS's ability to require that California and Oregon vessels which only fish in the 0-3 mile state territorial zone also carry observers. Observers are stationed along the US west coast from Bellingham, Washington to San Diego, California.

Program Goals

The WCGOP's goal is to improve estimates of total catch and discard by observing groundfish fisheries along the US west coast. Originally, the WCGOP focused observer effort in the LE trawl and fixed gear fisheries. In 2002, the WCGOP began deploying observers in open access fisheries while increasing its coverage of the LE trawl fishery. In 2005, the WCGOP increased its coverage of the LE fixed gear fishery and in 2006, the WCGOP improved coverage of the nearshore fishery. Currently, the WCGOP coverage goal is to maintain, at a minimum, 20% coverage of the LE trawl and fixed gear fisheries by landings, while continuing to improve coverage in the open access and nearshore fisheries. The observer coverage plan is available at: http:// www.nwfsc.noaa.gov/research/divisions/fram/observer/observersamplingplan.pdf.

METHODS

Limited Entry Groundfish Trawl Permit Selection

Limited entry groundfish trawl permits are selected for observation using stratified random sampling. First, the WCGOP determines the amount of time (based on available resources) it will take to observe the entire fleet; this is termed the selection cycle. The selection cycle varies due to changing priorities and observer resources. Because of the data and timeline requirements for fisheries managers and historical observer program vessel coverage, the selection cycle does not coincide with the date range of the observer data analyzed in this report. The data in this report were collected during three selection cycles. The three selection cycles were May 1, 2007 to February 29, 2008 (selection cycle 8), March 1, 2008 to October 31, 2008 (selection cycle 9), and November 1, 2008 to June 30, 2009 (selection cycle 10). For each selection cycle, the number of permits selected for observer coverage were as follows: selection cycle 8 - 108 permits; selection cycle 9 - 111 permits; selection cycle 10 – 116 permits.

To avoid selecting vessels that have not been participating in the LE bottom trawl fishery, the WCGOP classified permits meeting the following criteria as inactive:

- Permits that landed little or no non-Pacific hake groundfish during the previous 18-month period.
- All permits associated with catcher-processors or motherships that only participate in the offshore component of the Pacific hake midwater trawl fishery.
- Permits associated with recently sunk vessels or that are owned by deceased or terminally ill persons.
- Permits associated with unidentified vessels.

Permits which were determined to be inactive were removed from all selection cycles. If a vessel becomes active during the selection cycle, they are required to notify the WCGOP and are subsequently added to the selection list.

The WCGOP aggregates ports along the US west coast into port groups, which are considered sampling strata. Vessels with LE groundfish trawl permits are assigned to a port group based upon the location of the previous year's landings. Within each port group, the vessels are randomly selected for coverage during a two-month period, which coincides with the two-month cumulative trip limit period. After the entire fleet has been selected, a new selection cycle begins. This selection process is designed to produce a logistically feasible sampling plan with a distribution of observations throughout the entire geographic range of the fishery over time. Based on this design and the current level of WCGOP funding, the program is currently cycling through the LE groundfish trawl fleet every eight to ten months.

For more information on the rationale behind vessel selection, see the observer coverage plan at: http://www.nwfsc.noaa.gov/research/divisions/fram/observer/observersamplingplan.pdf

Coverage of the LE Groundfish Bottom Trawl Fishery

A list of fisheries in order of priority for observer coverage can be found in the WCGOP observer training manual (NWFSC 2008). The LE groundfish bottom trawl fleet is WCGOP's highest priority for observer coverage. Nearly all trips taken within the two-month period by a vessel whose permit has been selected are covered by an observer. However, in some cases, vessels whose permits are selected for a specific two-month period may not be covered by an observer during that period or may not be covered on all trips during that period.

A trip may be waived from observer coverage due to observer availability or a safety issue that can be fixed in a relatively short period of time. A few LE trawl vessels are given longer selection cycle waivers. A selection cycle waiver allows the vessel to fish without an observer during all trips taken during the entire selection cycle. Selection cycle waivers are given when a vessel has a serious safety concern that cannot be easily remedied.

Some vessels may receive a coverage period waiver. Coverage period waivers allow a vessel to fish all trips during a two-month period without an observer. Coverage period waivers are given for a variety of reasons including observer availability and vessel safety. Vessels are given a coverage period waiver for a specified two-month period and are added to the selection list for the next two-month period. For instance, if a vessel is given a coverage period waiver for January 1 through February 28, that vessel is automatically selected for observer coverage for

the period March 1 through April 30. Vessels continue to be added in the subsequent selection list until either an observer covers them or until the selection cycle ends.

Trawl Data Collection

Fisheries observers are trained professionals who monitor and record catch data on commercial fishing vessels by following protocols in the WCGOP Manual (NWFSC 2008).

Data collected by the observers on a trip basis include:

- Start time, end time, depth, and the start and end location of tows
- Gear type and fishing strategy
- Fish ticket identification numbers

Data collected by the observers on a tow basis include:

- Estimated total catch weight (including tows for which there is 100% discard)
- Weight of discard by catch category
- Reason for discard by catch category or species
- Species composition of discard by catch category
- Weight of fish retained by catch category which is generally copied from vessel logbooks
- Catch of prohibited species and incidental take of protected species
- Size composition, tags, and viability assessments for Pacific halibut
- Size composition of discarded fish
- Basic taxonomic composition of non-fish bycatch
- Biological collections (otoliths, maturity, food habits, genetic samples, etc.)

For more information regarding observer sampling on trawlers, refer to the WCGOP Observer Training Manual, Chapter 4.

Data Quality Control and Management

The WCGOP uses the following procedure to ensure that the quality of data collected is maintained:

1. Data are collected at-sea by the observer following protocols in the WCGOP Manual (NWFSC 2008).

2. Data are entered into a secure database system. A database table hierarchy is located in Appendix A.

3. Observers are debriefed by WCGOP staff after every two-month period. The debriefing includes:

    - Calculation, Data Form, and Sampling Methodology Checks - Observers send data to a debriefer on a monthly basis. The debriefer checks all calculations for accuracy, reviews data forms for completeness, and ensures appropriate sampling methodologies were

- Observer Logbook Review - Observers keep logbooks detailing the events of each trip, basic deck schematics, sampling methods used, communication logs, and confirmation of a current safety decal. Any tows during which sampling problems occurred are documented in the logbook and reviewed during debriefing.
- Interview - The observer is interviewed by the debriefer. During the interview, sampling methodologies employed on all trips are discussed and data errors are updated.
- Evaluation - Observers are evaluated on their performance based upon WCGOP generated criteria.
- Data Entry Check - Electronic data are compared to the raw data for keypunch errors. Also, all corrections discovered during debriefing are updated in the database program.

4. Database Quality Control Queries - Quality control queries are run to detect data that fall outside specified ranges and identify other inconsistencies between data elements. These database quality control queries are run every six months to a year on all data collected during a specified time period.
5. Database Update - The raw data from all entries that are highlighted by the quality control queries are reviewed and the electronic data are updated.

Data Processing

Data processing includes the following steps: expand the subsample of species composition to the tow-level; translate observer species codes to the appropriate PacFIN fish ticket data codes; identify and select the observer data records to match to fish tickets; query and process all PacFIN fish ticket data associated with the LE groundfish bottom trawl fishery; and merge observer data and fish ticket data. The translation of WCGOP to PacFIN species codes allows a more seamless match of observer data with fish ticket data and provides consistent information for calculating observer coverage of overall fishery landings.

The WCGOP database administrator expands the subsamples of catch categories to the tow level. A tow-level expansion is needed to estimate the total retained and discarded weight for each species because the sampling procedure used to collect the species composition data allows for subsampling of the population.

The following equation is used to calculate the weight of the subsample by summing across the observed weights of the individual species:

$$w_k = \sum_s x_{ks}$$

where:

x_{ks}= observed weight of the species s in catch category k in the subsample
w_k = weight of the subsample from catch category k

The sampling ratio (R_k) used to scale the subsample weights to the amount in the catch category is calculated by dividing the weight of the subsample by the total weight of the catch category

using the equation:

$$R_k = w_k / y_k$$

where:

y_k = the total weight of catch category k

The tow-level expanded weight of species s in category k is calculated by dividing the species weight in the subsample by the sampling ratio in the following equation:

$$X_{ks} = x_{ks} / R_k$$

where:

X_{ks}= the weight of species s in catch category k

Tallying the weight (X_{ks}) of the species (s) across all categories (k) within a tow provides the total weight of the species retained or discarded.

Once the tow-level expansion is complete, a data file that includes all fields necessary for the analysis is produced.

Observer data that meet the following criteria are removed for the fish ticket matching process:

- Trips with tows where no retained or discarded information is recorded.
- All discarded catch information.
- Trips where no fish ticket could be found.
- Partial trips (trips where the vessel was observed for less than 100% of their landed catch).

Next, the translation step of the process adds coding to the WCGOP observer data that allows for the appropriate match to the coding system used to record data on fish tickets in PacFIN.

Once these two steps are completed, the retained catch records from the observer data, which are typically vessel supplied estimates, are merged with fish ticket data to provide more accurate estimates of retained catch. The WCGOP data are linked to fish tickets by direct fish ticket number(s) obtained by the observer and/or by comparing the return date recorded by the observer with the dates of fish tickets from the vessel. For trips with multiple fish tickets, the fish ticket data are combined for analysis purposes. For trips with missing fish tickets, the observer retained catch data are not adjusted.

The WCGOP data are adjusted so that the total trip pounds of retained fish in a catch category matches the total trip pounds on the fish ticket, because the fish ticket weight is often more accurate and fish tickets are legally binding documents. To match the total trip pounds, the weights within each observer retained catch category are scaled up or down by the ratio of fish ticket and observer trip weights for that category, using the following equation to calculate the adjustment

factor:

$$A_{mtk} = x_{mtk} / \sum_{k} x_{mtk}$$

where:

x_{mtk} = lbs in catch category k in tow t in trip m
A_{mtk} = adjustment factor used for catch category k in tow t in trip m

The equation used to adjust the WCGOP data is:

$$x_{mtk} = A_{mtk} \times C_{mk}$$

where:

C_{mk} = lbs in catch category k for trip m recorded on the fish ticket

When a catch category in the WCGOP data cannot be matched to a fish ticket catch category, the WCGOP data are not adjusted. Catch categories found only on the fish tickets are distributed across the observed tows using the proportion of the observed catch per tow divided by the total observed catch per trip using the following equation:

$$B_{mt} = \frac{\sum_{k}\sum_{s} x_{mtks}}{\sum_{t}\sum_{k}\sum_{s} x_{mtks}}$$

$$C_{mtk} = B_{mt} \times C_{mk}$$

where:

B_{mt}= the proportion of observed catch in tow t in trip m
C_{mtk} = lbs in catch category k for tow t in trip m recorded on the fish ticket

Upon completion of the observer data merge and adjustment with fish ticket data, the data that had been previously removed for the matching process are then incorporated back into the data file for analysis.

Analysis

Observer coverage rates in the LE groundfish bottom trawl fishery were calculated as the proportion of this fishery's fleet-wide landings of Pacific Coast Groundfish Fishery Management Plan (FMP) groundfish (except Pacific hake) that were observed (Appendix B). Coverage rates were computed based on the complete dataset for 2008 and January through April of 2009.

After coverage rates were calculated but prior to subsequent analyses, data that met the following criteria were removed:

- Data where WCGOP data quality standards were not met.

- Tows where no retained or discarded information was recorded.
- Tows where the species composition of discarded catch was not known (unsampled discard).

Although all of the vessels included in the sampling frame described in this report are participants in the LE groundfish bottom trawl fishery, it is necessary to remove some portions of the LE trawl data prior to analysis for two reasons. First, after being selected, some LE bottom trawl vessels may switch to midwater trawl gear, which typically yields a species catch composition and discard/bycatch trends that are distinct from the bottom trawl fleet. All midwater trawl tows are therefore removed from the dataset prior to subsequent analyses. However, none of the observed tows in 2008 or January through April of 2009 were recorded to have employed midwater trawl gear.

Second, some LE bottom trawl vessels participate in more than one fishery on a single observed trip. This is primarily an issue in California, where LE bottom trawl vessels may also participate in the state-permitted California halibut fishery. California halibut tows can occur on the same trip as tows targeting groundfish and are identified in the LE bottom trawl dataset based on the following criteria:

- The observer recorded the tow target as California halibut.
- The observer recorded the tow target as 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 that met at least one of the above requirements were removed from the LE bottom trawl dataset and excluded from further analysis. The LE bottom trawl data removed from this analysis for the California halibut fishery are reported in the annual update of the report "Data Report and Summary Analyses of the West Coast California Halibut Trawl Fishery" (NMFS 2008a).

Once these steps had been applied, the ratio estimator technique (Cochran 1977) was used to estimate bycatch and discard rates for each major species or species group. Rates were calculated for all of the stocks currently managed under rebuilding plans, as well as stocks for which discard is estimated annually on a fleet-wide basis. Bycatch and discard information for prohibited and protected resources such as Pacific halibut, salmon, green sturgeon, marine mammals, seabirds, and sea turtles are provided in separate reports, which are available electronically at www.nwfsc.noaa.gov/research/ divisions/fram/observer/datareport/index.cfm. The ratio estimates (R_i) were calculated by area (i), season (j) and depth (d):

$$R_{ijd} = \sum_t y_{ijdt} / \sum_t x_{ijdt}$$

where:

y_{ijdt} = the discarded or total catch pounds of a species in tow t, area i, season j, and depth d

x_{ijdt} = the retained pounds of FMP groundfish species (except Pacific hake) in tow t, area i, season j, and depth d

The variance of R_{ijd} is approximated by using the following equation:

$$Var(R_{ijd}) = \left(\frac{\bar{y}_{ijd}}{\bar{x}_{ijd}}\right)^2 \left[\frac{s^2(y_{ijdt})}{\bar{y}_{ijd}^{\,2}} + \frac{s^2(x_{ijdt})}{\bar{x}_{ijd}^{\,2}} - \left(\frac{s^2(y_{ijdt})}{\bar{y}_{ijd}^{\,2}} \cdot \frac{s^2(x_{ijdt})}{\bar{x}_{ijd}^{\,2}}\right)\right]$$

where:

$\bar{x}_{ijd}$ and $\bar{y}_{ijd}$ = the means of x_{it} and y_{it} over the tows in area *i*, season *j*, and depth *d*

$s^2(x_{ijdt})$ and $s^2(y_{ijdt})$ = the standard errors of x_{it} and y_{it} over all tows in area *i*, season *j*, and depth *d*

This variance estimator is that which was employed by Pikitch et al. (1998) and is based on methods presented by Cochran (1977). Note that Var (R_{ijd}) cannot be calculated when $x_{ijdt} = 0$ or $y_{ijdt} = 0$ for all sets and should be considered with extreme caution when R_{ijd} is equal to one. In order to best support fishery management, variance was calculated separately for data in each geographic area, season and depth. Variance estimates, therefore, do not relate back directly to the random stratified sampling framework employed by the WCGOP, where vessels within each port group were the sampling unit.

Discard ratios were computed as the observed discard weight of each species over the observed weight of all retained groundfish species listed in the Pacific Coast Groundfish FMP, except Pacific hake. Similarly, bycatch ratios were calculated as the observed total catch weight (discarded + retained) divided by the observed weight of retained FMP groundfish (except Pacific hake). Pacific hake was excluded when using a retained groundfish denominator because it is inappropriate to include retained hake as a metric of effort in the LE bottom trawl fishery. Vessels that land this species are considered to be targeting Pacific hake exclusively and are thus part of a separate fishery.

In all cases where a FMP groundfish species grouping was used to compute discard and bycatch 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 by the processor under a grouped species code such as NUSP - northern unspecified slope rockfish. In some cases, this difference in species coding prevents observer and fish ticket weights from matching and adjusting 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 and bycatch ratio denominators, we prevent double-counting of retained weights. This is not a factor when using a single species in the denominator, such as sablefish in the fixed gear fisheries, as any retained weights in observer and fish ticket data that share the same species code will match and adjust properly.

RESULTS AND DISCUSSION

Overall Coverage Levels

The total number of observed trips, tows, vessels, and observed and total fleet-wide groundfish landings in the LE bottom trawl fishery are summarized in Table 1 for 2008 and for January through April of 2009. The observed coverage rate, calculated as the proportion of fleet-wide non-hake FMP groundfish landings observed, is provided with summaries for each WCGOP port group, two geographic areas north and south of the groundfish management line at 40°10' N. latitude, and for the entire US west coast.

Observer coverage in the LE bottom trawl fishery in 2008 increased on a coastwide basis relative to 2007 from 18% to 22% (NMFS 2008b). Overall, coverage was higher in the area north of 40°10' N. latitude (22%) than in the area south of this line (19%). When split out by port group, Astoria had the highest rate of observer coverage at 25%, followed by Eureka and San Francisco, which both had coverage rates of 24%. During January through April of 2009, landings from observed LE bottom trawl trips were 23% of the total tonnage for all LE bottom trawl trips. The early 2009 coverage level indicates a consistent rate in the current calender year which is above the target of 20% coverage.

Spatial Distribution of Observations

The distribution of observed trips and tows among port groups provides perspective on where observer coverage and, secondarily, fishing effort was focused along the US west coast in the LE groundfish bottom trawl fishery. Overall, observed trips were distributed throughout west coast port groups from Bellingham to Morro Bay, with peaks in Astoria (126 trips) and San Francisco (86 trips).

Relative to 2007, coverage levels in 2008 were up in all port groups except for Fort Bragg, where it decreased from 24% to 15%, and Monterey/Morro Bay/Santa Barbara, where it decreased from 16% to 8% (NMFS 2008b). Fort Bragg, Monterey/Morro Bay/Santa Barbara, and Neah Bay were the only port groups where coverage fell below the target of 20%. In the Neah Bay port group, 30.6 mt of groundfish were landed by limited entry trawl vessels throughout the year with no observer coverage. Coverage in the Monterey/Morro Bay/Santa Barbara port groups is reported in Table 1 as 8%. In collaboration with The Nature Conservancy (TNC), the WCGOP has observed one trawl vessel out of Morro Bay during periods other than those selected randomly. However, coverage rates summarized in Table 1 for the Monterey/Morro Bay/Santa Barbara port groups represent only those trips that were observed under the random stratified sampling design, and not the remaining trips observed outside of the selected periods for this vessel.

Coverage levels are subject to variation for several reasons. The WCGOP can control the number of boats observed, but not the amount of fish landed by these boats or the location of fishing effort. Coverage levels will fluctuate as a function of the amount of fish landed in a fishery and the amount of fish landed by the vessels observed, but these fluctuations are to be expected.

In 2008, spatial closures were employed in the LE groundfish trawl fishery by groundfish management. The Rockfish Conservation Area (RCA) closures in this fishery are the most complex in terms of latitudinal stratification and the variety of depth-related boundaries in use. Latitudinal stratification used in 2008 included the following: north of 48° 10' N. latitude, 48° 10' to 46° 38.17' N. latitude, 46° 38.17' to 46° 16' N. latitude, 46° 16' to 45° 46' N. latitude, 45° 46' to 43° 20.83' N. latitude, 43° 20.83' to 42° 40.50' N. latitude, 42° 40.50' to 40° 10' N. latitude, and south of 40° 10' N. latitude. Overall, boundaries were set anywhere from the shoreline out to 200 fathoms during 2008. The shoreward boundary was set at either 60 or 75 fathoms, when it was not extended to the shoreline in all of the latitudinal areas north of 40° 10' N. latitude. The RCA in the area south of 40° 10' N. latitude was set from 100 to 150 fathoms throughout the entire year.

Maps summarizing the spatial distribution of all LE bottom tows recorded in trawl logbooks and tows observed are presented for three sections of the US west coast in Figures 1a-c. In these figures, trawl tows were assigned to 10 km by 10 km grid blocks based on the starting locations of tows. The shading of each block reflects the number of trawl logbook tows, with darker shading indicating more tows. The circles overlaid on each block reflect the number of observed tows, with larger circles indicating more tows. Blocks with the darkest shading and the smallest circles indicate fishing locations that received less observer coverage relative to fishing effort.

The spatial distribution of the LE trawl fleet and those tows observed by the WCGOP can be reviewed for general spatial sampling coverage in 2008. Figure 1a depicts the coast north of Coos Bay, Oregon. Figure 1b presents the area south of Coos Bay, Oregon to just north of San Francisco, California. Figure 1c portrays the remainder of the California coast with bottom trawl fishing effort, as far south as Morro Bay. Coastwide, the spatial distribution of fleet-wide LE bottom trawl tows appears to have been generally well sampled by observers during 2008. However, there are several distinct areas on the Oregon continential shelf where vessels fished in 2008 but there was no observer coverage of tows in those areas (Figures 1b-1c). Based on trawl logbook data, vessels fishing in those particular areas were observed in 2008, but during other times of the year when they were fishing in different locations. Spatially, there was less overall fishing effort on the Washington continential shelf in 2008 relative to 2007. Coastwide, observer coverage demonstrated a very high correspondence to those areas with high fishing effort by the fleet on the continential slope.

Table 2 presents the number of tows and retained weight of non-hake FMP groundfish from observer and logbook data separated by management area (north and south of 40° 10' N. latitude), depth interval (0-125, 126-250, and > 250 fathoms) and season (winter: November through April, summer: May through October). This provides an alternative form of observer coverage rate for the 2008 LE bottom trawl fishery that is based on observer and logbook tows rather than fleet-wide fish ticket landings. A similar table for the 2007 LE bottom trawl fishery was provided in the groundfish total mortality report (Bellman et al. 2008, Table 1), although the table used a finer level of depth stratification. The finer level of stratification used in previous years analyses required that strata routinely be combined across depth or season to ensure an adequate sample size for analysis. It is unclear how the process of combining strata may influence discard and bycatch ratios. The validity of stratification in terms of isolating variance in discard has not yet been ojectively tested. Until more work can be completed to evaluate

which strata (area/depth/season) are most appropriate for this discard analyis, broader stratification is warrented. Thus, broader depth strata were used in the present analysis, which continue to highlight the areas shoreward and seaward of RCA closures relevant in the fishery management framework. Broader depth stratification are also necessary for consistency when evaluating discard or bycatch over time, as depth-based spatial closures change on a yearly basis. The depth strata utilized in this report were also used in analyses which evaulated discard and total mortality estimates over time, using all available years of WCGOP data from 2002-2008 (Bellman and Heery In Review).

Observed Total Catch, Discard Ratios, and Bycatch Ratios

Tables 3a and 3b present the observed total catch weight (mt), discard weight (mt) and percent discarded for each species north and south of 40° 10’ N. latitude in 2008 and January through April of 2009. Observed coastwide total catch (discarded + retained) in the LE groundfish bottom trawl fishery was largely comprised of dover sole, sablefish, arrowtooth flounder, thornyheads, skates, and petrale sole. Of the rebuilding species, darkblotched rockfish and Pacific ocean perch were caught in the largest amounts north of 40° 10’ N. latitude. Canary rockfish, widow rockfish, bocaccio, and a very small amount of yelloweye rockfish were also caught in this area. South of 40° 10’ N. latitude, the primary rebuilding species caught were darkblotched rockfish, bocaccio, and canary rockfish, but a small amount of Pacific ocean perch, widow rockfish, and cowcod were also observed. A small amount of chinook salmon was caught north and south of 40° 10’ N. latitude, which will also be reported as numbers of individual fish in the annual update of the current report “Observed and Estimated Total Bycatch of Salmon in the 2007 U.S. West Coast Groundfish Fisheries” (Heery et al. 2009).

For other non-rebuilding fish species (excluding Pacific halibut, which is prohibited), the decision to discard is dependent not only upon levels of cumulative retained catch and corresponding landing limits, but also upon the size, condition, and marketability of the catch. Relative to 2007, the total observed catch and discard weight of most species increased, although this could be attributed to higher levels of coverage coastwide. Overall, Pacific hake constituted the largest component of observed discard coastwide. Relatively large amounts of spiny dogfish, skates, arrowtooth flounder, dover sole, and tanner crab were also discarded.

Observed discard of Pacific halibut in the 2008 limited entry bottom trawl fishery included 63 metric tons of Pacific halibut discard north of 40°10' N. latitude and an additional 1.2 metric tons south of 40°10' N. latitude. Regulation prohibits Pacific halibut from being landed in this fishery. The data reported here were used to inform subsequent estimates of fleet-wide Pacific halibut bycatch. The fleet-wide analysis is presented in the report “Pacific Halibut Bycatch in IPHC Area 2A in the 2008 Groundfish Bottom Trawl Fishery” (Wallace and Hastie 2009).

Tables 4a and 4b present discard ratios and standard errors for the 2008 LE groundfish bottom trawl fishery by management area, season, and depth interval. Species are grouped for discard ratio calculations according to Appendix C. All discard ratios in Table 4 were computed using retained FMP groundfish species (except Pacific hake) in the denominator. In Table 5, discard ratios are re-computed using summaries of strata tow duration (in trawl hours) in the denominator. Discard ratios computed using a retained groundfish species grouping in the denominator have traditionally been used to expand observer data to the fleet-wide level for

coastwide discard estimation in the LE groundfish bottom trawl fishery (Bellman et al. 2008).

Tables 6a and 6b provide bycatch ratios for the 2008 LE groundfish bottom trawl fishery. All bycatch ratios for this fishery were computed using retained FMP groundfish species (except Pacific hake) in the denominator. Bycatch ratios for rebuilding species are presented in Figure 2 for all years observed. Relative to 2007, bycatch ratios for most rebuilding species decreased slightly north of 40° 10' N. latitude. The bycatch ratio for yelloweye rockfish did go up slightly in this area, with the ratio for this species slightly higher in the summer between 0 and 125 fathoms. South of 40° 10' N. latitude, bycatch ratios for bocaccio and widow rockfish increased slightly from 2007 to 2008.

Figure 3 displays pie charts representing the percentage of observed tows in which rebuilding species were caught by management area. Overall, no catch of rebuilding species (0 pounds) was observed on more than 75% of bottom trawl tows. On a percentage basis, darkblotched rockfish was caught most frequently, as 23% of observed tows caught this species north of 40˚10' N. latitude. Pacific ocean perch was the next most commonly encountered species, with catch recorded on 19% of observed tows in the northern strata. For many rebuilding species, catch was observed on less than 5% of bottom trawl tows in each strata (i.e. north – bocaccio, canary, widow, and yelloweye rockfish; south – cowcod, Pacific ocean perch, canary, widow, yelloweye rockfish).

Biological Data Collection and Summary

WCGOP observers primarily collect length or sexed lengths from non-protected resources although in some circumstances they also collect otoliths or viabilities. Biological data are collected from randomly selected individuals within a species composition sample and only from the discarded portion of the total catch. Biological data collected in the LE groundfish bottom trawl fishery for non-protected resources from September 2003 through April 2009 are summarized in Table 7. Biological data were only summarized in this report for species with more than 30 observations.

The length frequency distributions of discarded rebuilding species from biological data are reported for the LE groundfish bottom trawl fishery in Figure 4. Figure 5 presents length frequency distributions of other discarded groundfish species.

For protected resources, including any species regulated under the Endangered Species Act (ESA), additional types of biological data are collected whenever possible. It is the policy of the WCGOP to collect lengths, photographs, and tissue samples from all green sturgeon observed, as well as sexes and fin ray samples from all dead individuals. 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 and snouts. Information regarding biosampling procedures for marine mammals, seabirds, green sturgeon, and salmon is available in the WCGOP observer training manual (NWFSC 2008).

Table 8 summarizes the biological data for protected fish resources collected by observers in the LE groundfish bottom trawl fishery from September 2003 through April 2009. Across all years, observers sampled a total of 554 chinook salmon, 8 coho salmon, 2 chum salmon, and 3

unidentified salmon.

Summary

Bycatch and discard rates calculated from observer data collected in the LE bottom trawl fishery from January 2008 through April 2009 are now available for use in the management process. The observer data will be used in conjunction with additional commercial bottom trawl fishery data to inform current fishery management in projection modeling of bycatch. In addition, these discard rates will be used to estimate discard at the fleet-wide level to account for annual coastwide mortality in this fishery. The collected biological data will also be available for use by stock assessment authors.

REFERENCES

Cochran, W.G. 1977. Sampling Techniques. John Wiley & Sons, New York. 155 p.

Bellman, M.A., Heery, E., and J. Hastie. 2008. Estimated Discard and Total Catch of Selected Groundfish Species in the 2007 U.S. West Coast Fisheries. Northwest Fisheries Science Center, 2725 Montlake Blvd E, Seattle, WA. Available at http://www.nwfsc.noaa.gov/research/divisions/fram/observer/datareport/docs/TotalMortality_update2007.pdf

Heery, E.H., Bellman, M.A., and J. Hastie. 2009. Observed and Estimated Total Bycatch of Salmon in the 2007 U.S. West Coast Groundfish Fisheries. Northwest Fisheries Science Center, 2725 Montlake Blvd E, Seattle, WA. Available at http://www.nwfsc.noaa.gov/research/divisions/fram/observer/datareport/docs/salmon_mortality_2007.pdf

National Marine Fisheries Service (NMFS). 2008a. Data Report and Summary Analyses of the West Coast California Halibut Trawl. NOAA, Northwest Fisheries Science Center, 2725 Montlake Blvd E, Seattle, WA. Available at http://www.nwfsc.noaa.gov/research/divisions/fram/observer/datareport/docs/ca_halibut_final08.pdf

National Marine Fisheries Service (NMFS). 2008b. West Coast Groundfish Observer Program Data Report and Summary Analyses of the West Coast Limited Entry Groundfish Bottom Trawl Fishery. NOAA, Northwest Fisheries Science Center, 2725 Montlake Blvd E, Seattle, WA. Available at http://www.nwfsc.noaa.gov/research/divisions/fram/observer/datareport/docs/limited_entry_trawl_obs_rpt_oct08.pdf.

Northwest Fisheries Science Center (NWFSC). 2008. West coast groundfish observer training manual. NOAA, West Coast Groundfish Observer Program. Northwest Fisheries Science Center, 2725 Montlake Blvd E, Seattle, WA. Available at http://www.nwfsc.noaa.gov/research/divisions/ fram/observer/observermanual/observermanual.cfm.

Pacific Fishery Management Council (PFMC). 2008. Pacific Coast Groundfish Fishery Management Plan for the California, Oregon, and Washington Groundfish Fishery as Amended through Amendment 19. PFMC, 7700 NE Ambassador Place, Suite 100, Portland, OR. Available at: http://www.pcouncil.org/groundfish/gffmp/fmpthru19.pdf.

Pikitch, E.K., Wallace, J.R., Babcock, E.A., Erikson, D.L. Saelens, M., and G. Oddsson. 1998. Pacific halibut bycatch in the Washington, Oregon, and California groundfish and shrimp trawl fisheries. N. Am. J. Fish. Mgmt. 18:569-586.

Wallace, J., and J. Hastie. 2009. Pacific Halibut Bycatch in IPHC Area 2A in the 2008 Groundfish Bottom Trawl Fishery. NOAA, Northwest Fisheries Science Center, 2725 Montlake Blvd E, Seattle, WA.

FIGURES

Figure 1a. Locations of observed and fleet logbook trawl tows north of Coos Bay, Oregon in 2008.

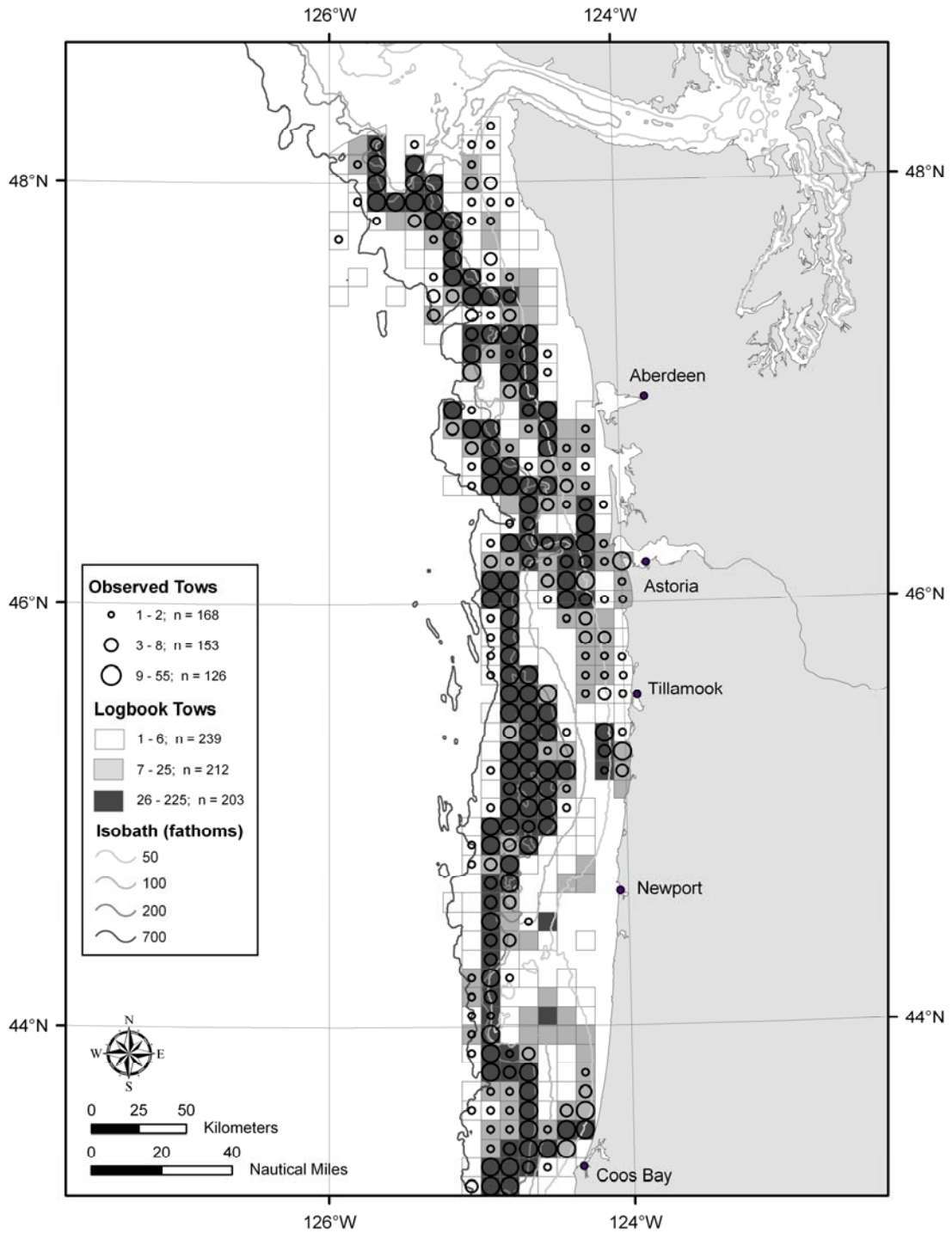


Figure 1b. Locations of observed and fleet logbook trawl tows south of Coos Bay, Oregon and north of San Francisco, California in 2008.

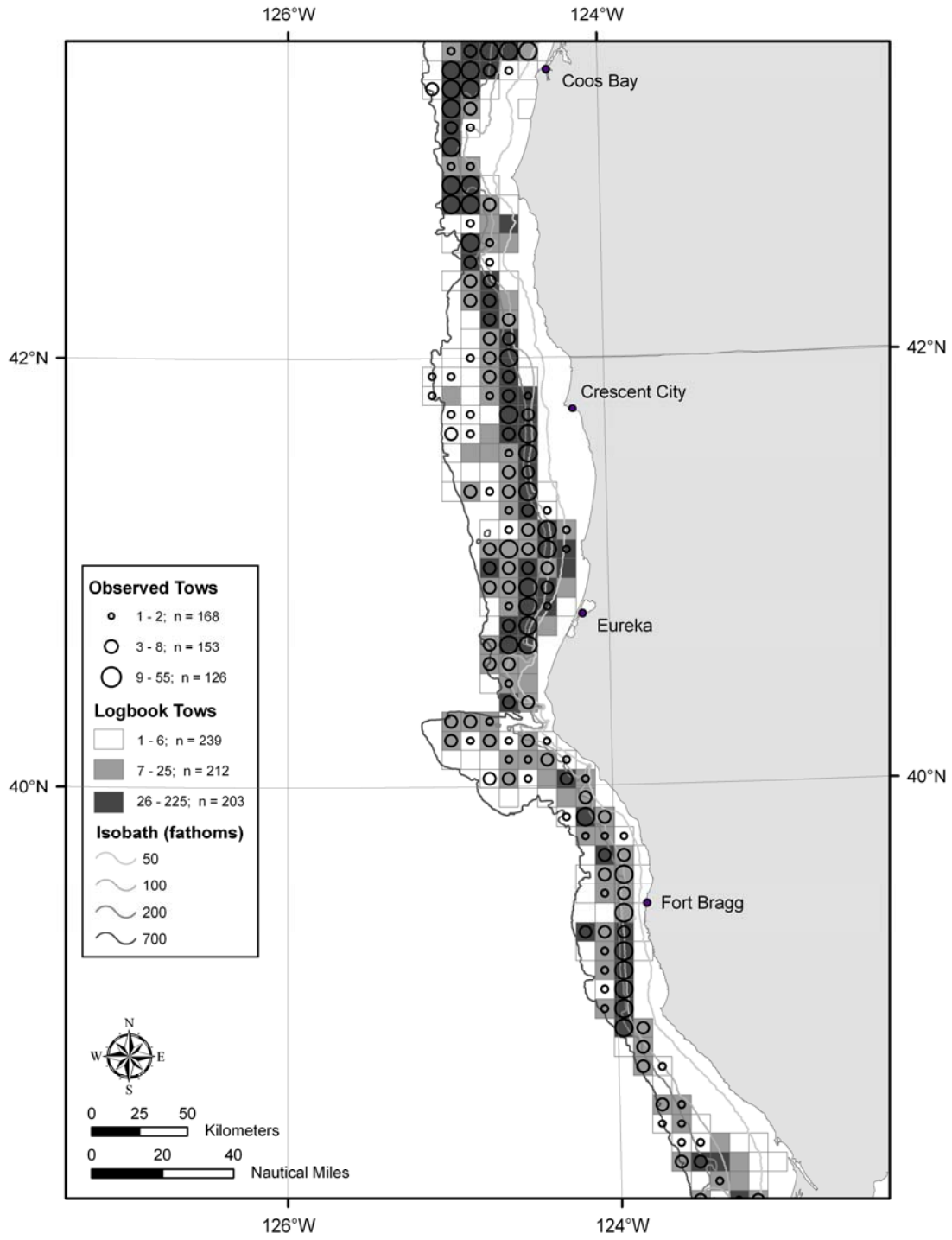


Figure 1c. Locations of observed and fleet logbook trawl tows south of San Francisco, California in 2008.

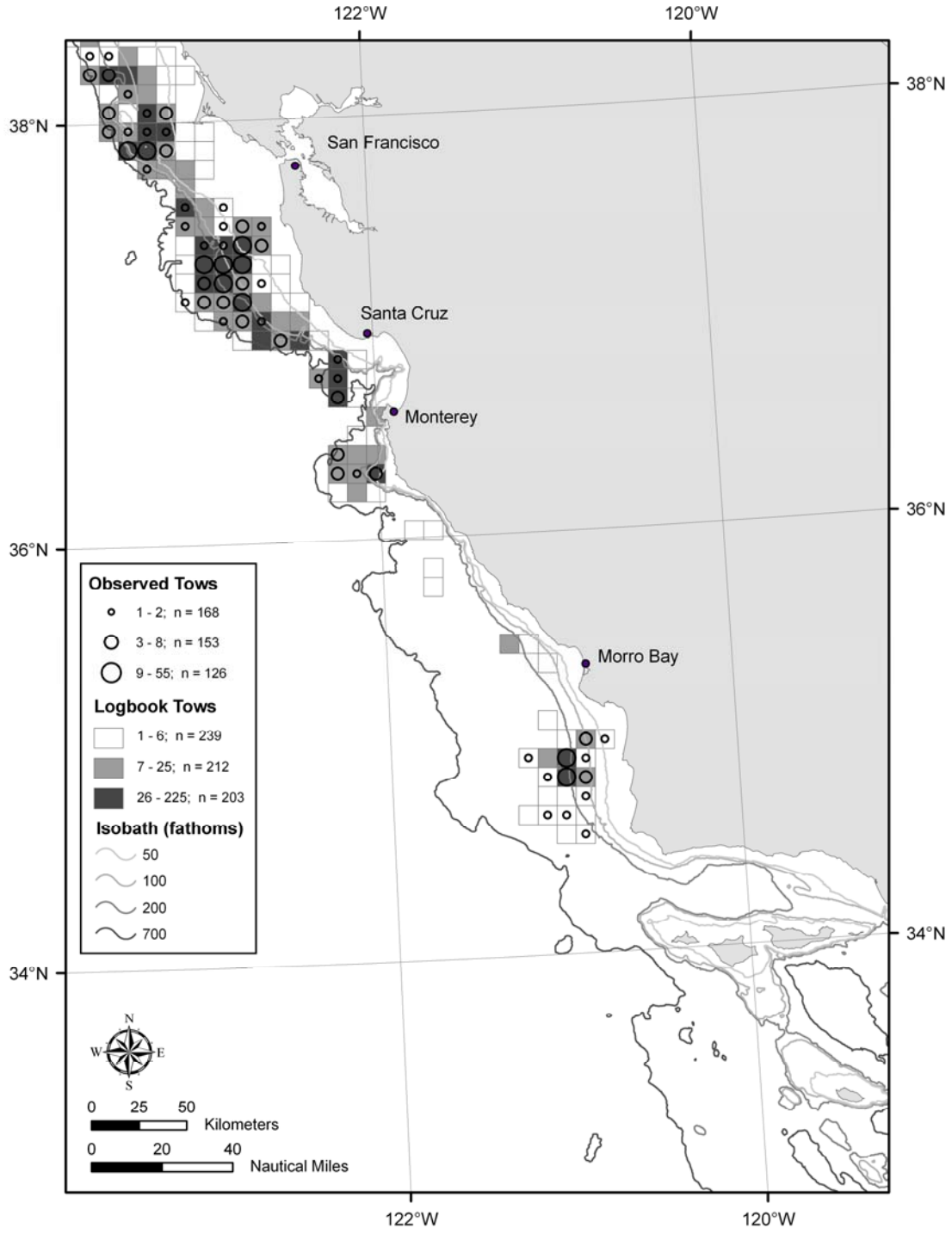


Figure 2. Bycatch ratios of rebuilding species for all observed years from the limited entry groundfish bottom trawl fishery by management area; north (solid circles) and south (outlined circles) of 40˚10’ N. latitude. Bycatch ratios were computed as the observed total catch of rebuilding species divided by the weight of retained FMP groundfish (excluding Pacific hake).

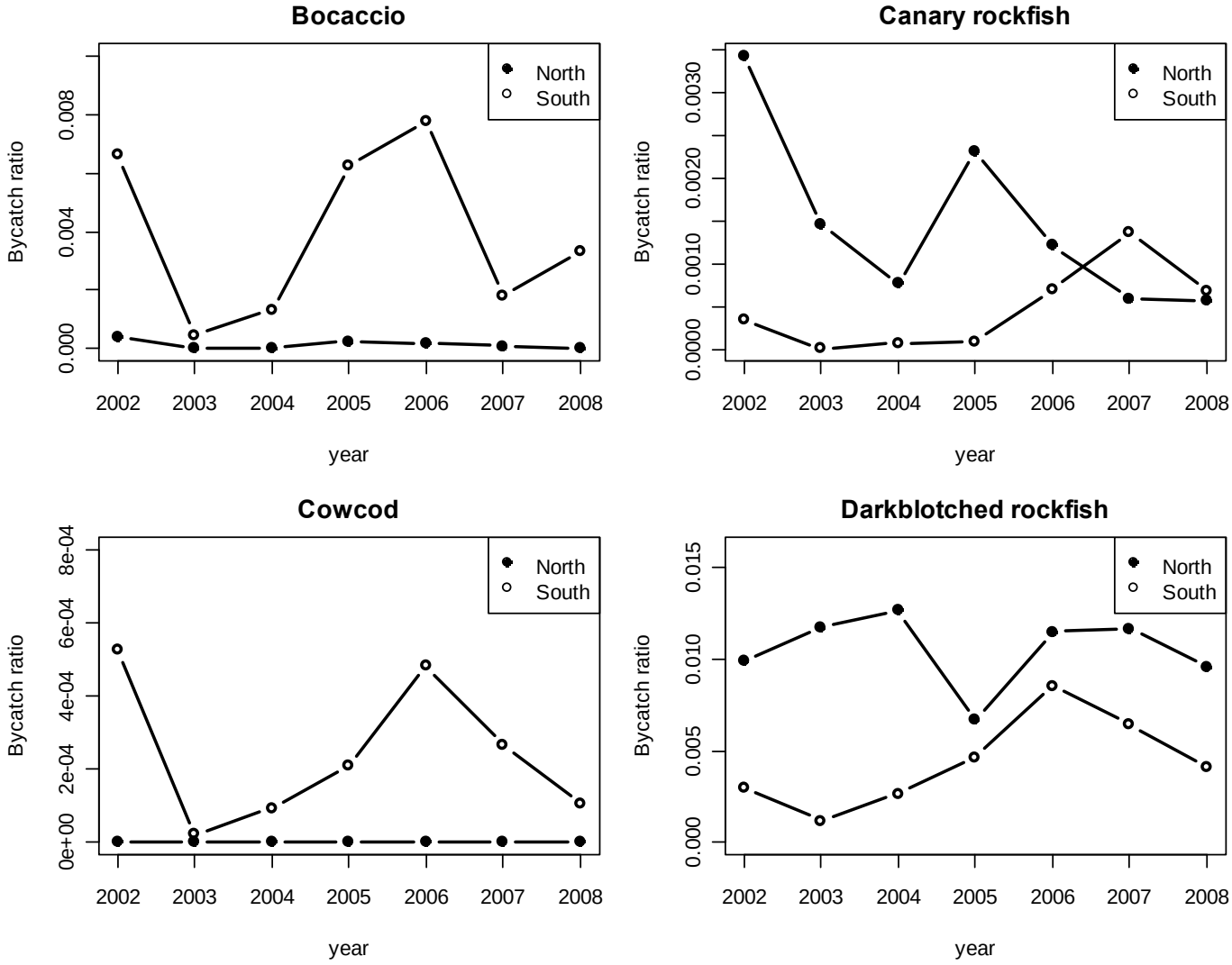


Figure 2 continued. Bycatch ratios of rebuilding species for all observed years from the limited entry groundfish bottom trawl fishery by management area; north (solid circles) and south (outlined circles) of 40˚10’ N. latitude. Bycatch ratios were computed as the observed total catch of rebuilding species divided by the weight of retained FMP groundfish (excluding Pacific hake).

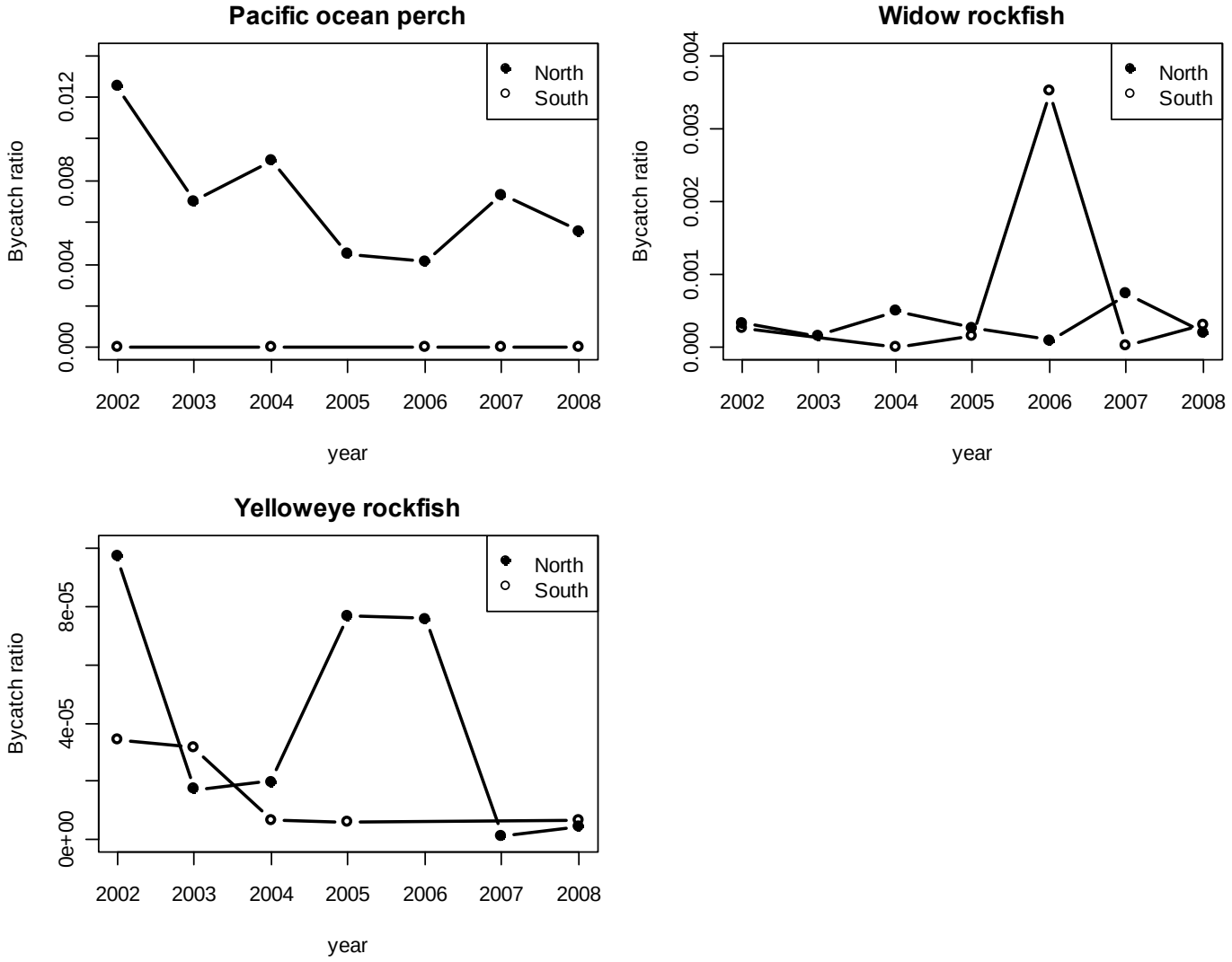
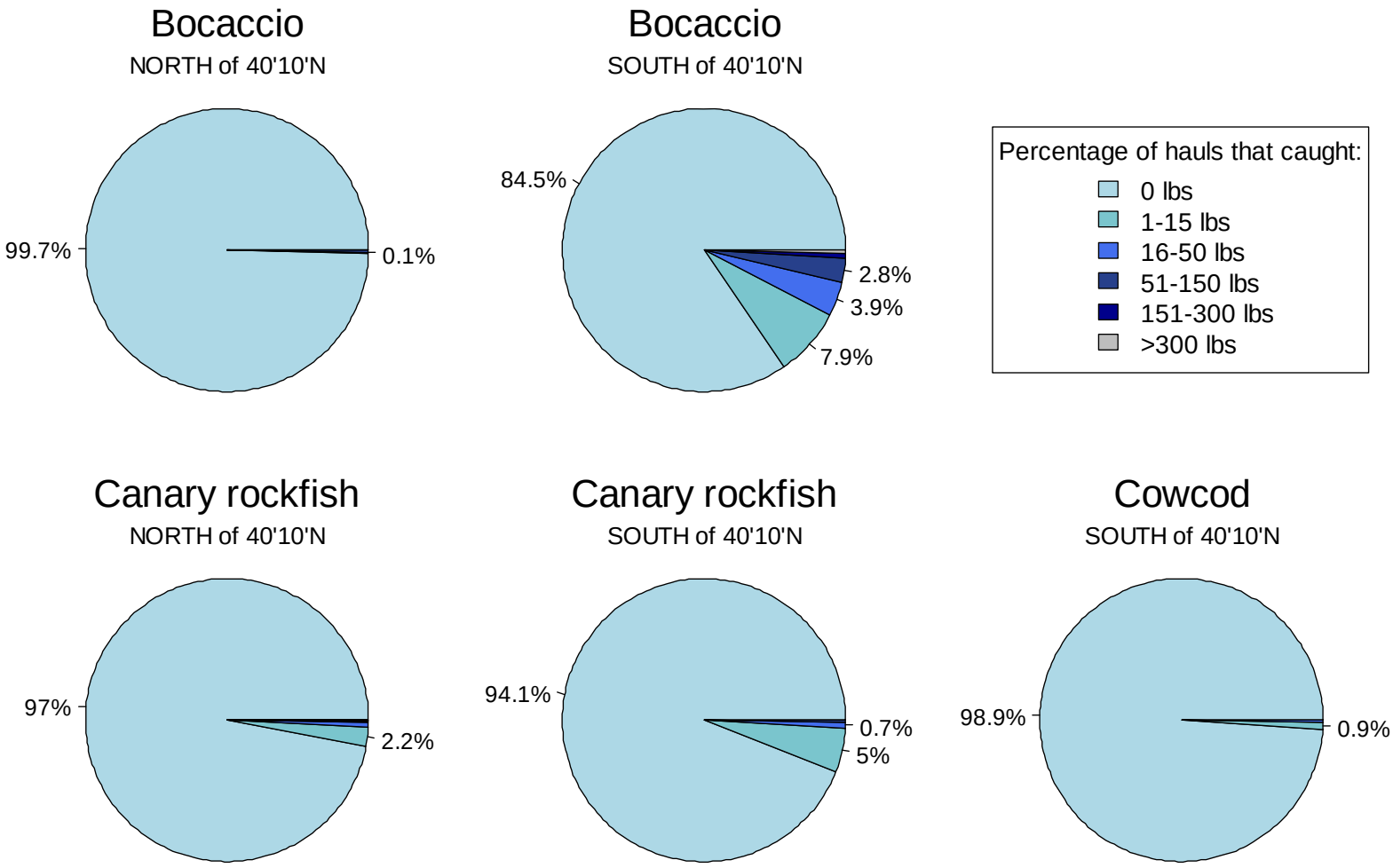


Figure 3. Pie charts showing the percentage of observed tows during which rebuilding species were caught (0, 1-15, 16-50, 51-150, 151-300, > 300 lbs) in the 2008 limited entry groundfish bottom trawl fishery by management area.



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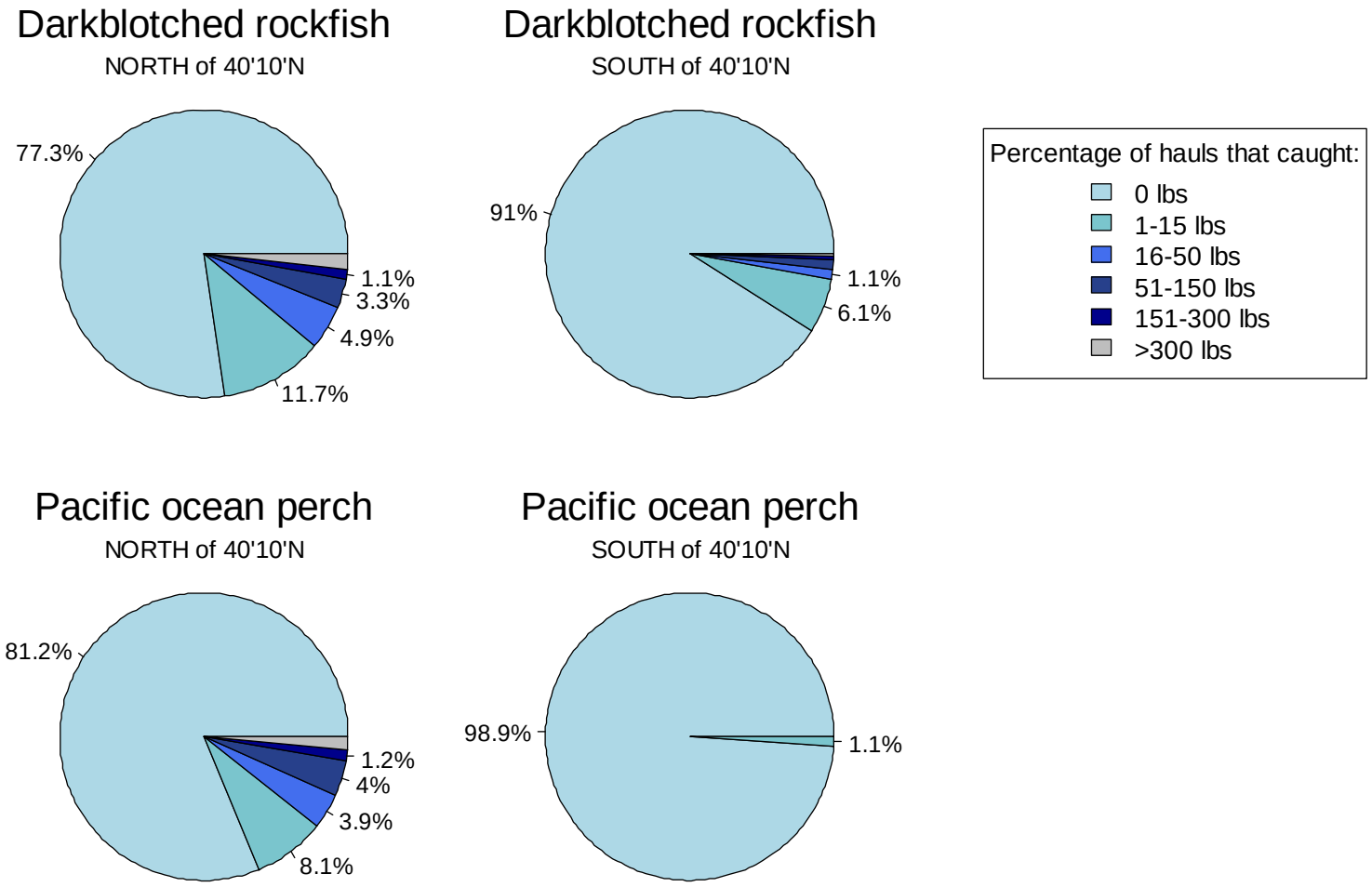

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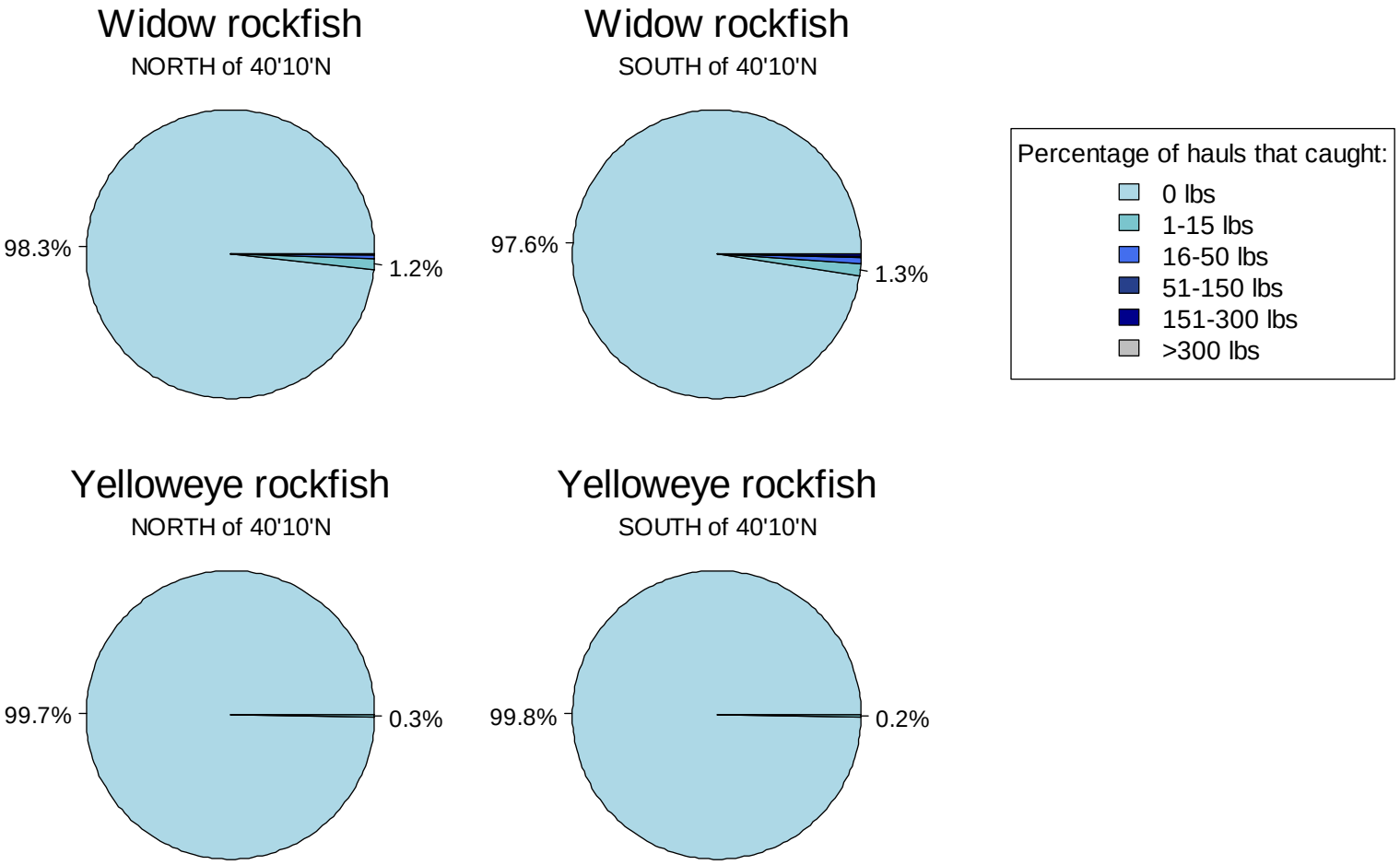


Figure 4. Length frequency distributions of discarded rebuilding species observed in the LE groundfish bottom trawl fishery from September 2003 – April 2009.

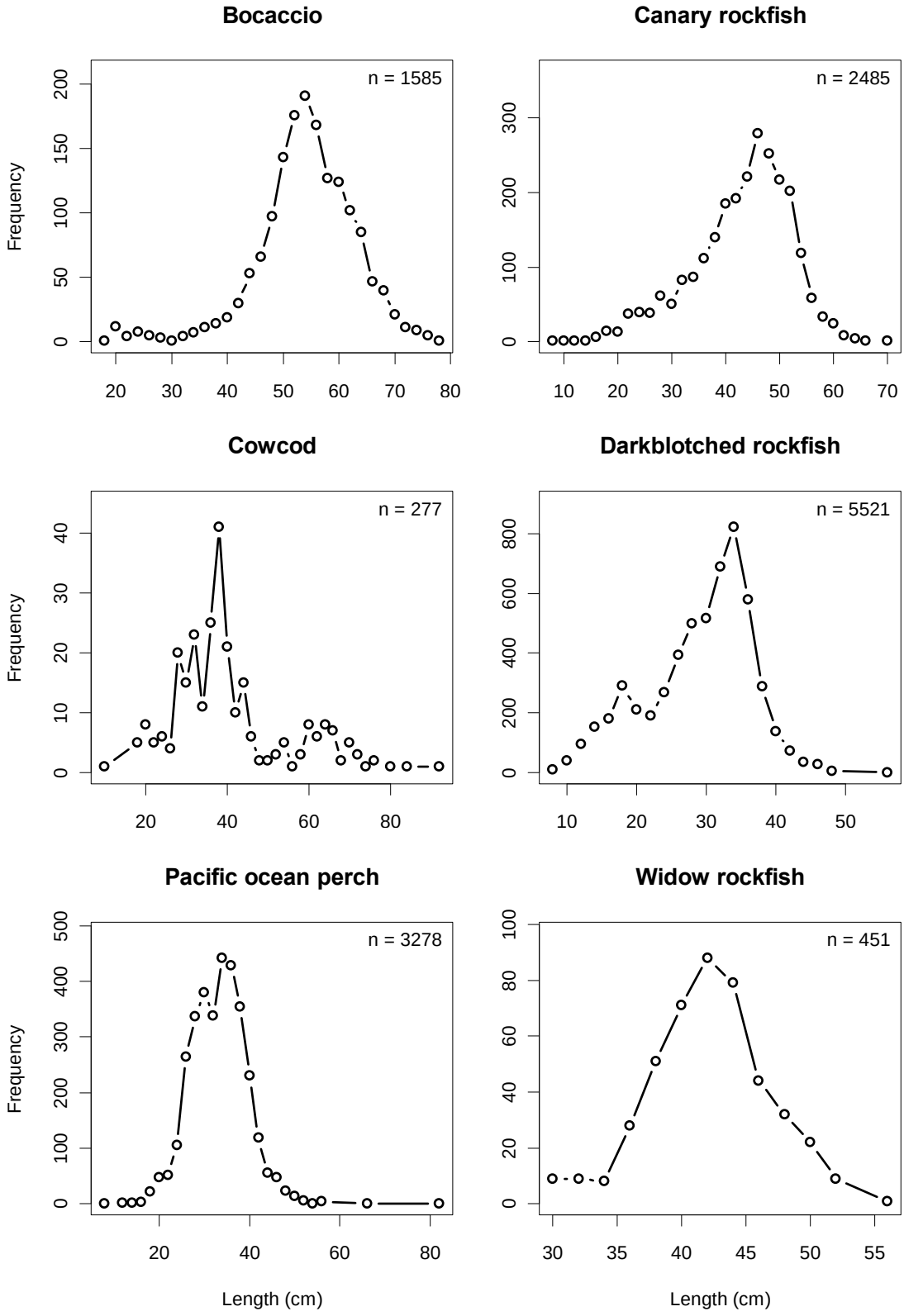


Figure 4 continued. Length frequency distributions of discarded rebuilding species observed in the LE groundfish bottom trawl fishery from September 2003 – April 2009.

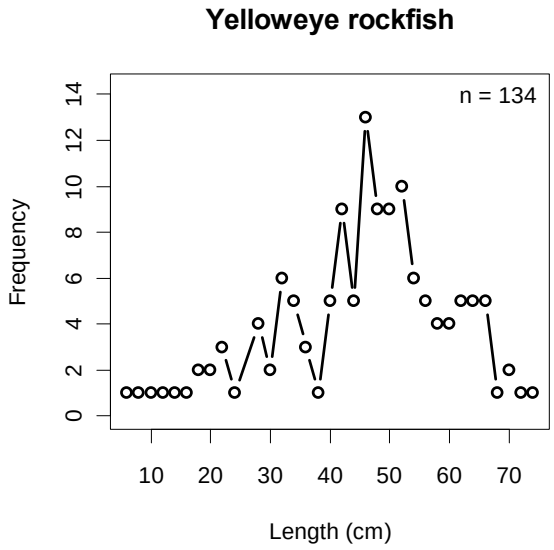
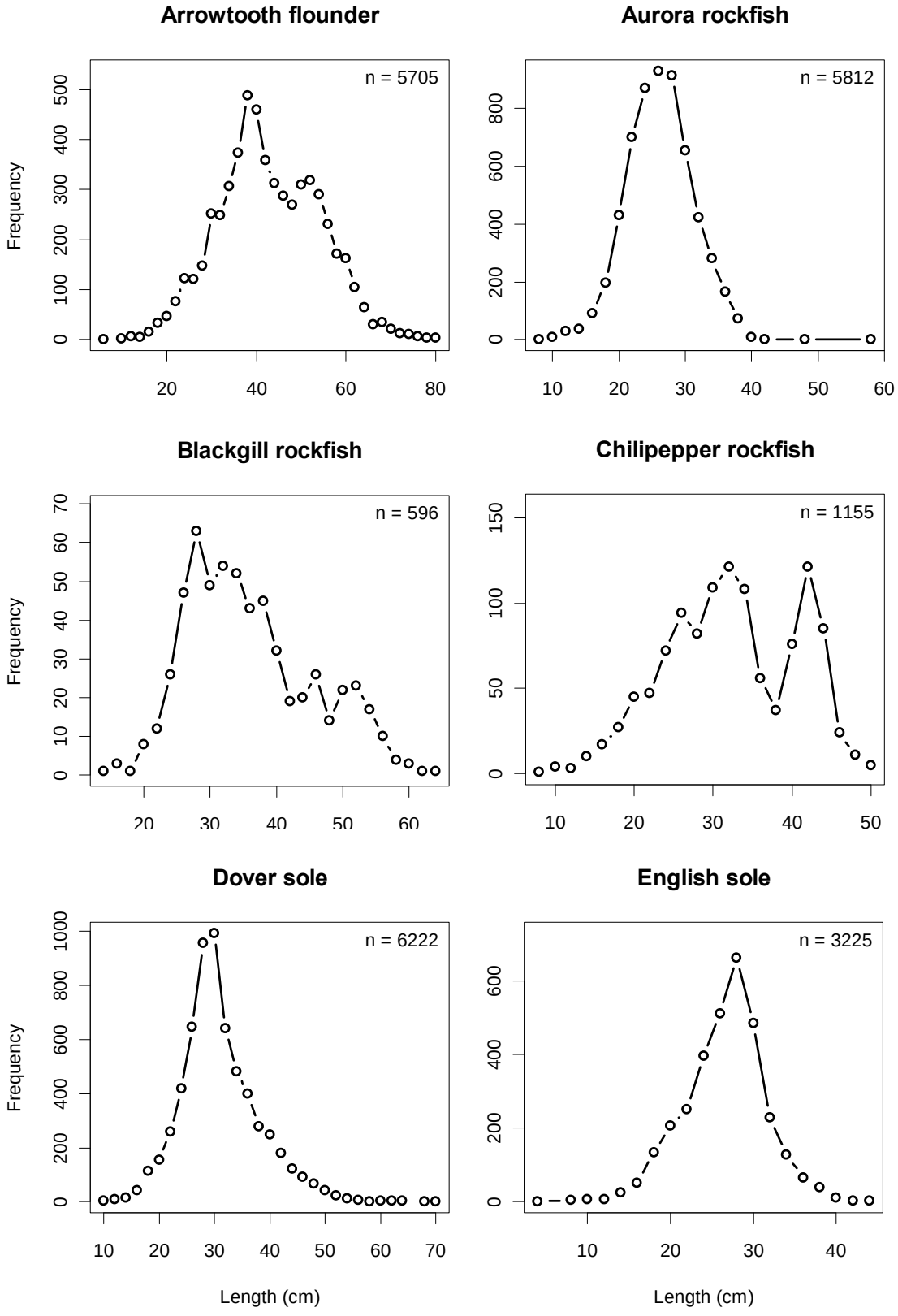


Figure 5. Length frequency distributions of discarded (non-rebuilding) species observed in the LE groundfish bottom trawl fishery from September 2003 – April 2009. Plots are only provided for groundfish species for which at least 100 length measurements are available.



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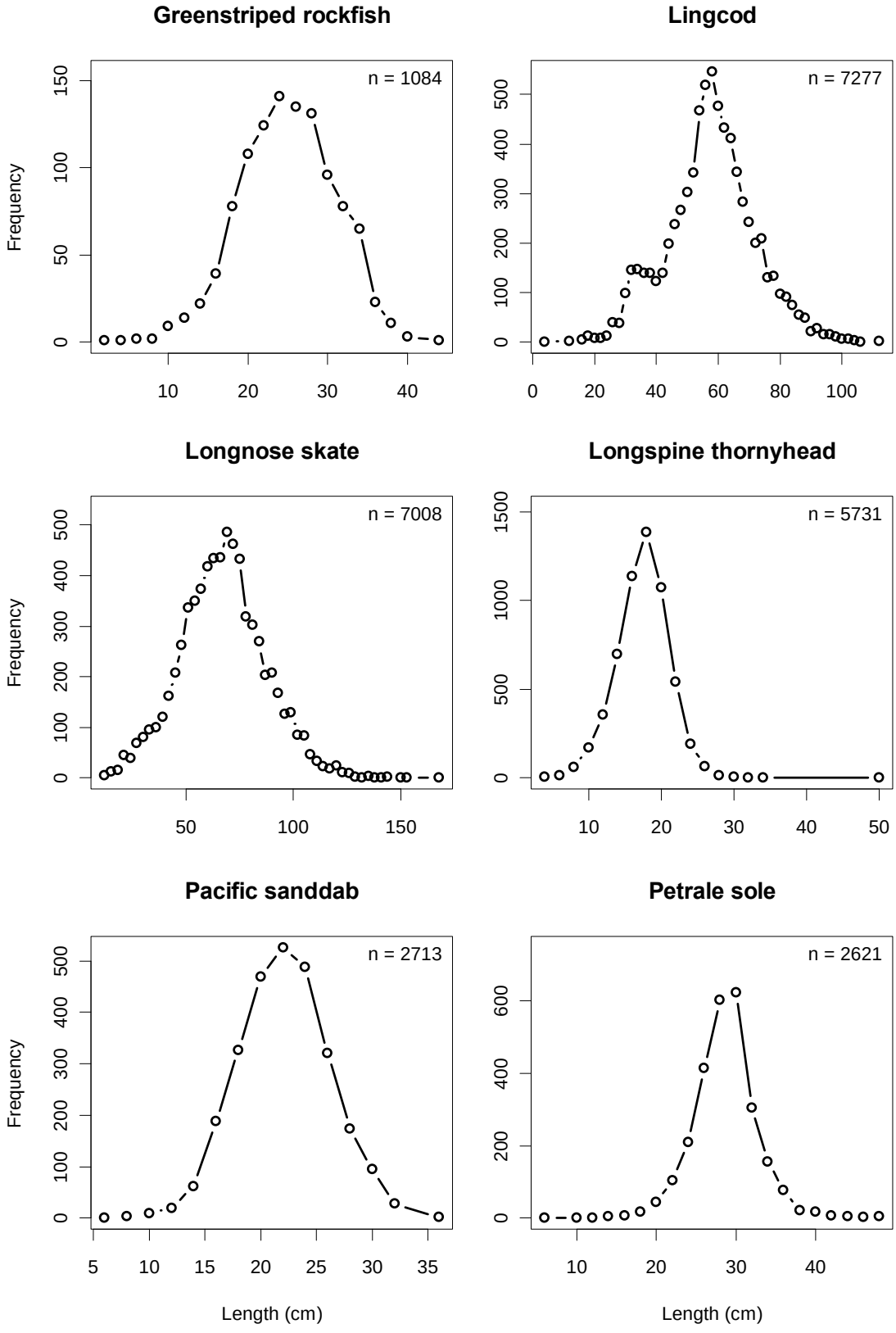

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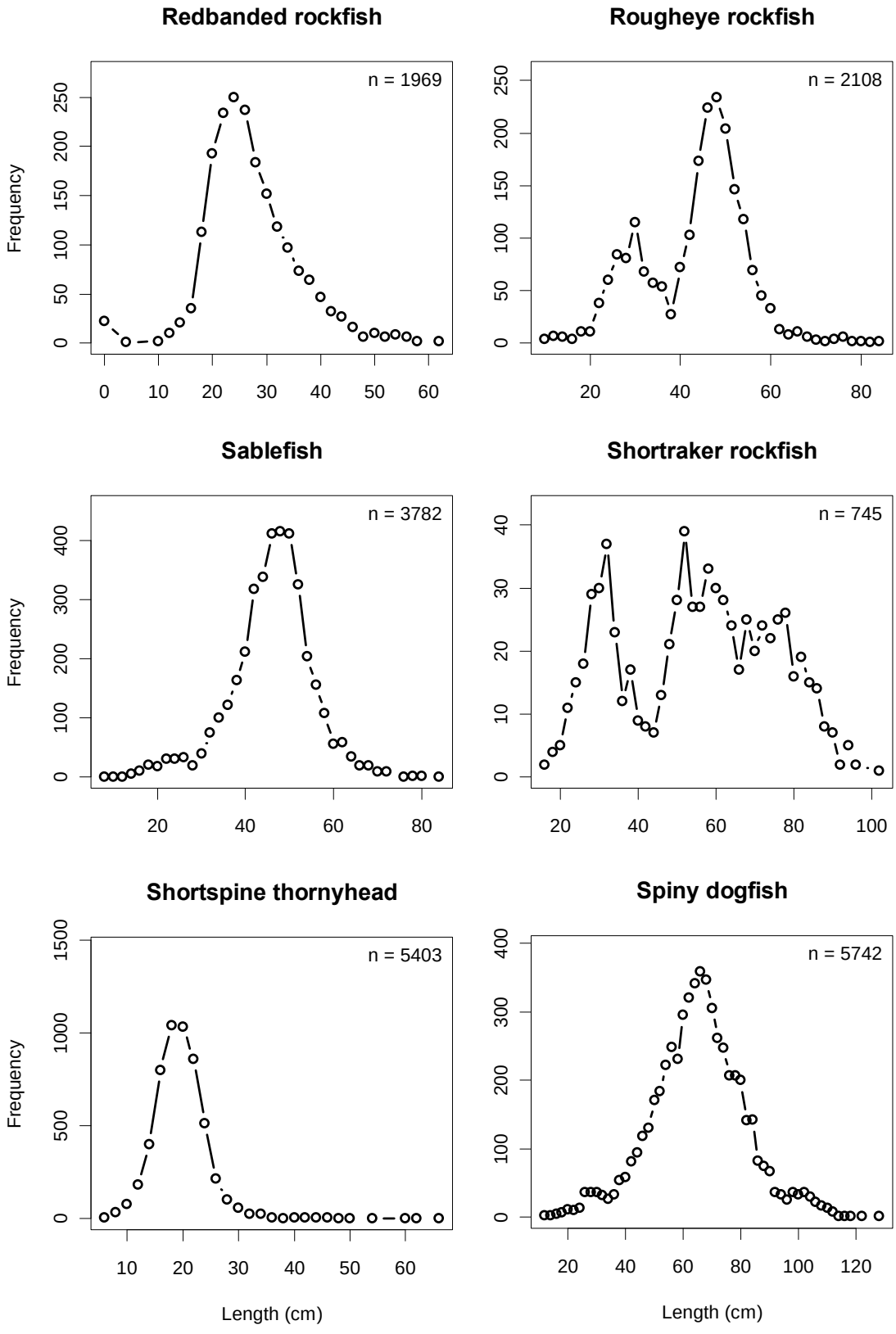

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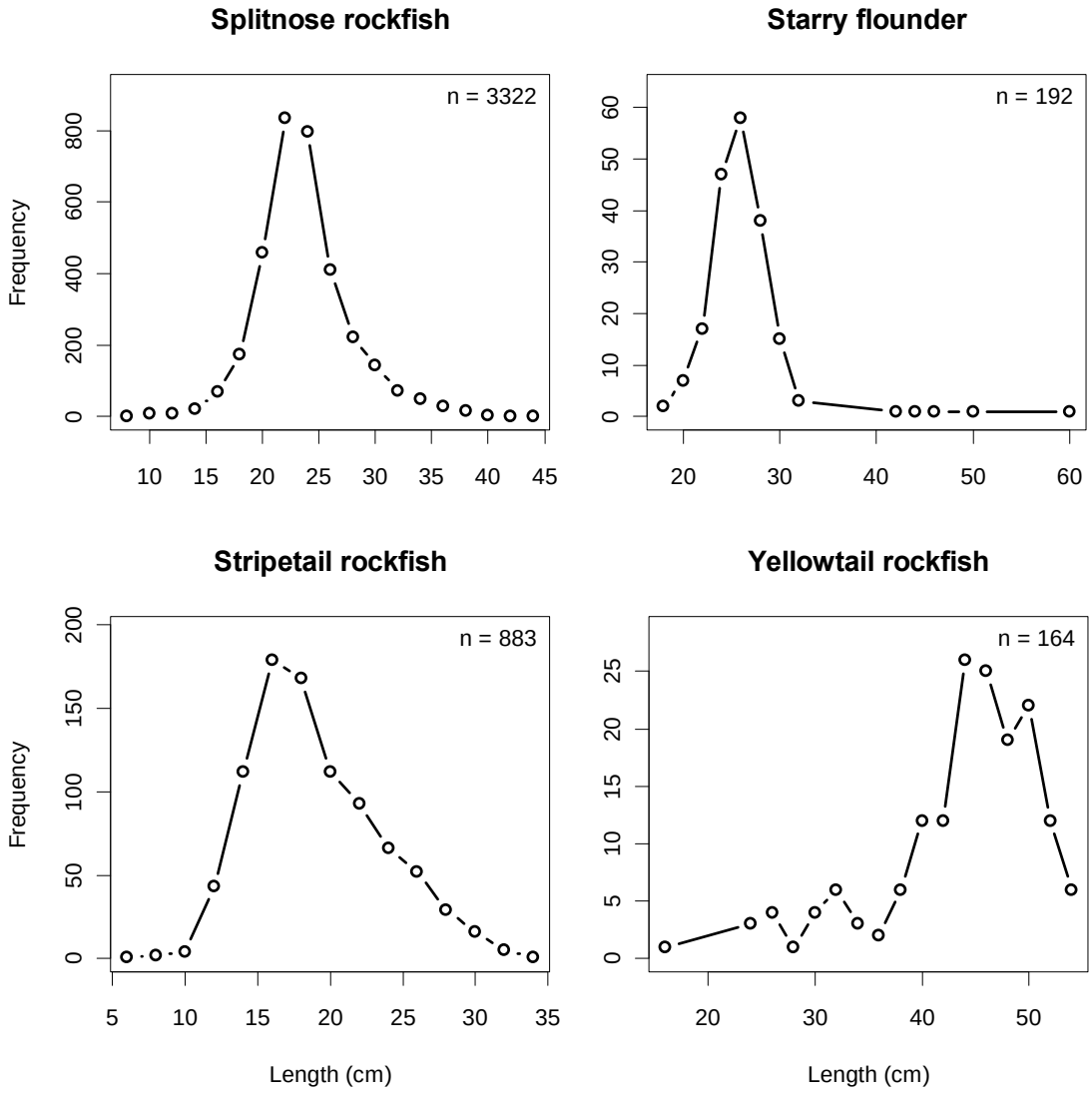

TABLES

Table 1. Total trips, tows, vessels, and groundfish landings observed in the limited entry groundfish bottom trawl fishery in 2008 (above) and January through April 2009 (below). Coverage rates (last column on right) for each port group and management area are computed as the proportion of total FMP groundfish landings (excluding Pacific hake) that were observed. Data are combined as needed to ensure confidentiality.

	Port Group	Number of observed trips	Number of observed tows	Number of observed vessels	Observed groundfish landings (mt)	Total groundfish landings (mt)	% of total groundfish landings observed
2008	Bellingham	7	80	4	147.3	823.1	18%
	Neah Bay	--	--	--	--	30.6	--
	Astoria	126	1392	30	2178.8	8789.6	25%
	Newport	58	500	15	697.8	3136.1	22%
	Coos Bay	70	377	17	691.7	3535.7	20%
	Crescent City	29	152	12	352.4	2021.7	17%
	Eureka	70	352	10	711.4	2920.9	24%
	Fort Bragg	26	207	6	249.4	1613.1	15%
	San Francisco	86	360	10	223.5	944.7	24%
	Monterey Morro Bay Santa Barbara	11	45	3	33.0	397.0	8%
	Los Angeles	--	--	--	--	--	--
	North of 40°10' N	358	2826	83	4728.6	21257.7	22%
	South of 40°10' N	132	639	23	556.9	2954.8	19%
	Coastwide total	483	3465	107	5285.4	24212.4	22%

Jan - Apr 2009	Bellingham Neah Bay	8	74	3	158.4	536.3	30%
	Astoria	46	452	15	820.4	3856.5	21%
	Newport	31	253	10	390.1	1389.9	28%
	Coos Bay	40	207	10	369.3	1571.1	24%
	Crescent City	30	158	8	250.8	802.0	31%
	Eureka	13	76	4	143.0	947.3	15%
	Fort Bragg	9	57	3	88.7	526.2	17%
	San Francisco Monterey Morro Bay	9	50	5	47.6	239.2	20%
	Santa Barbara	--	--	--	--	--	--
	Los Angeles	--	--	--	--	--	--
	North of 40°10' N	168	1213	48	2121.2	9103.0	23%
	South of 40°10' N	20	114	10	147.2	765.5	19%
	Coastwide total	186	1327	58	2268.4	9868.5	23%

Note: The number of trips and vessels north and south of 40°10' N. latitude do not sum to coastwide totals because some vessels fish in both areas on the same trip. Also, any hauls that are lacking spatial information are included in coastwide and port group totals only.

Table 2. Number of tows and retained weight (mt) of FMP groundfish species (excluding Pacific hake) from observer and logbook data for the 2008 limited entry groundfish bottom trawl fishery by depth, season, and management area. 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.

	NORTH of 40°10' N Lat.				SOUTH of 40°10' N Lat.			
	Number of tows		Retained groundfish (mt)		Number of tows		Retained groundfish (mt)	
Depth interval (fathoms)	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer
Observed fleet								
0-125	423	440	779.7	280.7	10	207	9.7	103.2
126-250		656		1298.0	39	55	34.8	76.5
> 250	523	685	1092.7	1063.2	64	83	93.2	162.7
Total	946	1781	1872.4	2641.8	113	345	137.7	342.4
All trawl logbooks								
0-125	2560	2568	4366.8	1571.8	229	793	102.8	316.8
126-250		2450		4429.8	509	380	556.2	477.9
> 250	2889	2815	6037.7	4242.9	378	620	587.1	876.8
Total	5449	7833	10404.5	10244.6	1116	1793	1246.2	1671.6
Percentage observed								
0-125	17%	17%	18%	18%	4%	26%	9%	33%
126-250		27%		29%	8%	14%	6%	16%
> 250	18%	24%	18%	25%	17%	13%	16%	19%
Total	17%	23%	18%	26%	10%	19%	11%	20%

Table 3a. Observed catch weight (mt), discard weight (mt), and percent discarded from observed vessels in the 2008 limited entry groundfish bottom trawl fishery by management area. Rebuilding, non-rebuilding, and non-groundfish species are presented alphabetically. Retained weights were grouped when species-specific information was unavailable or grouped on fish tickets and did not allow for a species-specific comparison of total catch versus discard.

	NORTH of 40°10' N			SOUTH of 40°10' N		
	Total catch (mt)	Discard (mt)	Total % discarded	Total catch (mt)	Discard (mt)	Total % discarded
Rebuilding species						
Bocaccio *	0.09	0.05	56.0%	1.59	1.40	87.9%
Canary rockfish	2.57	2.50	97.1%	0.33	0.02	4.9%
Cowcod *	--	--	--	0.05	0.05	100.0%
Darkblotched rockfish *	43.24	23.99	55.5%	1.96	0.06	2.9%
Pacific ocean perch *	25.21	8.91	35.3%	0.01	0.00	0.0%
Widow rockfish	0.94	0.58	61.6%	0.15	0.15	100.0%
Yelloweye rockfish *	0.02	0.01	69.7%	0.00	0.00	100.0%
Non-rebuilding species						
Arrowtooth flounder	743.94	115.84	15.6%	1.30	0.96	73.8%
Big skate	11.00	10.60	96.3%	0.40	0.40	100.0%
Black rockfish	0.01	0.00	10.0%	0.03	0.00	0.0%
Bronzespotted rockfish	--	--	--	0.00	0.00	0.0%
Brown rockfish	0.00	0.00	100.0%	0.01	0.00	10.0%
Butter sole	0.06	0.06	100.0%	--	--	--
Cabezon	0.02	0.02	72.4%	--	--	--
California skate	0.01	0.01	100.0%	1.10	1.10	100.0%
Chilipepper rockfish	0.17	0.09	54.2%	22.18	14.79	66.7%
Dover sole	2211.70	83.37	3.8%	187.70	23.62	12.6%
English sole	57.82	8.27	14.3%	16.81	5.59	33.3%
Flatfish	43.36	21.38	49.3%	35.30	13.65	38.7%
Curlfin turbot		0.07			0.08	
Deepsea sole		5.32			2.04	
Hornyhead turbot		--			0.01	
Hybrid sole		0.10			--	
Pacific sanddab		11.12			9.75	
Roughscale sole		0.00			--	
Slender sole		1.94			0.29	
Unspecified flatfish		2.26			0.54	
Unspecified sanddab		0.58			0.93	
Flathead sole	0.27	0.00	1.7%	--	--	--
Grenadier	44.28	34.82	78.7%	14.26	12.23	85.8%
Abyssal grenadier		0.12			--	
California grenadier		0.91			0.14	
Giant grenadier		24.42			5.93	
Pacific grenadier		7.72			6.01	
Popeye grenadier		0.04			0.00	
Shoulderspot grenadier		0.03			--	
Smooth grenadier		0.04			--	
Softhead grenadier		0.00			--	
Unspecified grenadier		1.54			0.15	
Kelp greenling	0.00	0.00	19.7%	--	--	--
Lingcod	31.25	12.33	39.5%	5.98	2.52	42.0%

* Mislabeling or grouping of these species on non-distributed fish tickets may cause retained catch weights to be underestimated.

Table 3a continued.

	NORTH of 40°10' N			SOUTH of 40°10' N		
	Total catch (mt)	Discard (mt)	Total % discarded	Total catch (mt)	Discard (mt)	Total % discarded
Non-rebuilding species (cont.)						
Nearshore rockfish	0.01	0.01	69.4%	--	--	--
Quillback rockfish		0.01			--	
Unspecified nearshore rockfish		--			--	
Other unspecified roundfish	0.00	0.00	100.0%	--	--	--
Other unspecified rockfish	0.04	0.00	0.0%	--	--	--
Pacific cod	2.69	0.03	1.0%	--	--	--
Pacific hake	249.67	249.67	100.0%	19.30	19.30	100.0%
Petrale sole	260.72	6.54	2.5%	80.25	1.84	2.3%
Rex sole	96.45	6.12	6.3%	6.68	1.86	27.8%
Rock sole	0.02	0.01	47.7%	0.04	0.04	100.0%
Sablefish	606.43	29.91	4.9%	66.23	6.75	10.2%
Sand sole	2.65	0.10	4.0%	--	--	--
Shelf rockfish	21.49	2.39	11.1%	5.01	2.83	56.4%
Flag rockfish		--			0.00	
Greenblotched rockfish		--			0.00	
Greenspotted rockfish		0.00			0.02	
Greenstriped rockfish		0.55			0.31	
Halfbanded rockfish		0.00			0.00	
Pygmy rockfish		--			0.00	
Redstripe rockfish		0.06			--	
Rosethorn rockfish		0.52			0.01	
Shortbelly rockfish		0.00			1.17	
Silvergray rockfish		0.30			--	
Stripetail rockfish		0.14			1.31	
Vermilion rockfish		--			0.00	
Unspecified shelf rockfish		0.82			0.00	
Skates	366.19	88.04	24.0%	52.11	39.88	76.5%
Aleutian skate		0.75			--	
Black skate		5.99			2.35	
Deepsea skate		0.07			--	
Longnose skate		66.75			33.33	
Pacific electric ray		0.10			0.23	
Sandpaper skate		14.05			3.50	
Starry skate		0.00			0.29	
Unspecified skate		0.32			0.18	
Slope rockfish	63.34	39.55	62.4%	51.84	19.12	36.9%
Aurora rockfish		6.16			0.70	
Bank rockfish		0.00			0.01	
Blackgill rockfish		0.80			0.01	
Redbanded rockfish		1.28			0.13	
Rougheye rockfish		8.15			0.00	
Sharpchin rockfish		0.85			--	
Shortraker rockfish		4.20			--	
Shortraker/rougheye rockfish		0.32			--	
Splitnose rockfish		16.78			14.18	
Yellowmouth rockfish		0.01			--	
Unspecified slope rockfish		0.99			4.08	
Soupfin shark	0.03	0.00	0.0%	--	--	--
Spiny dogfish	171.10	166.11	97.1%	32.64	15.04	46.1%
Spotted ratfish	25.11	25.11	100.0%	10.74	10.74	100.0%

Table 3a continued.

	NORTH of 40°10' N			SOUTH of 40°10' N		
	Total catch (mt)	Discard (mt)	Total % discarded	Total catch (mt)	Discard (mt)	Total % discarded
Non-rebuilding species (cont.)						
Starry flounder	1.73	0.26	15.2%	0.02	0.00	0.0%
Swordspine rockfish	--	--	--	0.00	0.00	100.0%
Thornyheads	510.41	46.96	9.2%	97.60	7.86	8.1%
Longspine Thornyhead		33.04			7.59	
Shortspine Thornyhead		11.00			0.25	
Mixed thornyheads		2.92			0.02	
Yellowtail rockfish	2.36	0.20	8.5%	0.01	0.01	100.0%
Non-groundfish species						
American shad	0.175	0.175	100.0%	0.040	0.040	100.0%
Anchovy (unidentified)	0.000	0.000	100.0%	--	--	--
Anglerfish (unidentified)	0.000	0.000	100.0%	--	--	--
Armored box crab	--	--	--	0.200	0.200	100.0%
Bairdi tanner crab	0.009	0.009	100.0%	--	--	--
Barracudina (unidentified)	0.001	0.001	100.0%	--	--	--
Bigfin eelpout	0.502	0.502	100.0%	0.107	0.107	100.0%
Bigscale (unidentified)	0.000	0.000	100.0%	--	--	--
Bivalves (unidentified)	0.002	0.002	100.0%	--	--	--
Black eelpout	0.039	0.039	100.0%	0.001	0.001	100.0%
Black hagfish	0.001	0.001	100.0%	--	--	--
Blackbelly eelpout	0.000	0.000	100.0%	--	--	--
Blackedge poacher	0.001	0.001	100.0%	--	--	--
Blob sculpin	0.051	0.051	100.0%	--	--	--
Blue shark	0.057	0.057	100.0%	--	--	--
Brown box crab	0.003	0.003	100.0%	0.172	0.172	100.0%
Brown cat shark	8.671	8.671	100.0%	2.115	2.115	100.0%
Brown Irish lord sculpin	0.002	0.002	100.0%	--	--	--
Brown smoothhound shark	0.308	0.308	100.0%	0.000	0.000	100.0%
California king crab	0.010	0.010	100.0%	0.008	0.008	100.0%
California slickhead	2.277	2.277	100.0%	2.457	2.457	100.0%
Cat shark (unidentified)	0.063	0.063	100.0%	0.142	0.142	100.0%
Crab (unidentified)	0.006	0.006	100.0%	0.000	0.000	100.0%
Cusk-eel (unidentified)	0.001	0.001	100.0%	--	--	--
Decorator/spider crab (unidentified)	0.002	0.002	100.0%	0.000	0.000	100.0%
Deep-sea spider crab	0.003	0.003	100.0%	--	--	--
Dragonfish (unidentified)	0.000	0.000	100.0%	--	--	--
Dungeness crab	34.403	34.403	100.0%	5.635	5.635	100.0%
Eelpout (unidentified)	7.171	7.171	100.0%	0.388	0.388	100.0%
Fangtooth	0.000	0.000	100.0%	0.000	0.000	100.0%
Filetail cat shark	0.001	0.001	100.0%	0.112	0.112	100.0%
Giant wrymouth	0.016	0.016	100.0%	--	--	--
Hagfish (unidentified)	0.001	0.001	100.0%	--	--	--
Hair crab	0.012	0.012	100.0%	0.002	0.002	100.0%
Hermit crab (unidentified)	0.011	0.011	100.0%	0.000	0.000	100.0%
Hundred fathom mora	0.001	0.001	100.0%	--	--	--
Jackmackerel	--	--	--	0.009	0.009	100.0%
Jellyfish (unidentified)	0.284	0.284	100.0%	0.015	0.015	100.0%
King (Chinook) salmon	0.115	0.115	100.0%	0.007	0.007	100.0%
King crab (unidentified)	0.003	0.003	100.0%	0.000	0.000	100.0%
Lancetfish (unidentified)	0.050	0.050	100.0%	--	--	--
Laternfish (unidentified)	0.005	0.005	100.0%	0.000	0.000	100.0%

Table 3a continued.

	NORTH of 40°10' N			SOUTH of 40°10' N		
	Total catch (mt)	Discard (mt)	Total % discarded	Total catch (mt)	Discard (mt)	Total % discarded
Non-groundfish species (cont.)						
Longfin dragonfish	0.000	0.000	100.0%	--	--	--
Longnose cat shark	0.022	0.022	100.0%	0.001	0.001	100.0%
Longnose lancetfish	0.022	0.022	100.0%	--	--	--
Longspine combfish	0.001	0.001	100.0%	0.061	0.061	100.0%
Loosejaw (unidentified)	0.003	0.003	100.0%	--	--	--
Lumpsucker (unidentified)	--	--	--	0.005	0.005	100.0%
Lyre crab (unidentified)	0.000	0.000	100.0%	--	--	--
Mackerel (unidentified)	0.001	0.001	100.0%	--	--	--
Manefish	0.000	0.000	100.0%	--	--	--
Midshipman (unidentified)	--	--	--	0.092	0.092	100.0%
Mola mola (sunfish)	--	--	--	0.008	0.008	100.0%
Monkeyface prickleback	0.016	0.016	100.0%	--	--	--
Octopus (unidentified)	1.686	1.450	86.0%	0.380	0.355	93.3%
Other nongroundfish	4.725	2.505	53.0%	0.077	0.077	100.0%
Oxeye oreo	0.002	0.002	100.0%	--	--	--
Pacific flatnose	1.035	1.035	100.0%	0.812	0.812	100.0%
Pacific halibut	63.501	63.501	100.0%	1.241	1.241	100.0%
Pacific herring	0.026	0.026	100.0%	0.002	0.002	100.0%
Pacific lamprey	0.001	0.001	100.0%	--	--	--
Pacific mackerel	--	--	--	0.003	0.003	100.0%
Pacific rock crab	--	--	--	0.000	0.000	100.0%
Pacific sardine	0.442	0.442	100.0%	0.001	0.001	100.0%
Pacific scabbardfish	0.002	0.002	100.0%	--	--	--
Pacific sleeper shark	1.208	1.208	100.0%	0.147	0.147	100.0%
Pacific tom cod	--	--	--	0.000	0.000	100.0%
Pacific viperfish	0.001	0.001	100.0%	0.000	0.000	100.0%
Paperbone (unidentified)	0.001	0.001	100.0%	--	--	--
Pink surfperch	--	--	--	0.031	0.031	100.0%
Plainfin midshipman	0.000	0.000	100.0%	0.005	0.005	100.0%
Poacher (unidentified)	0.029	0.029	100.0%	0.037	0.037	100.0%
Prickleback (unidentified)	0.000	0.000	100.0%	--	--	--
Prowfish	0.002	0.002	100.0%	--	--	--
Ragfish	0.122	0.122	100.0%	--	--	--
Red rock crab	0.004	0.004	100.0%	0.011	0.011	100.0%
Ribbonfish (unidentified)	0.006	0.006	100.0%	--	--	--
Ronquil (unidentified)	0.000	0.000	100.0%	--	--	--
Scarlet king crab	0.075	0.075	100.0%	0.022	0.022	100.0%
Sculpin (unidentified)	0.495	0.495	100.0%	0.030	0.030	100.0%
Sea cucumber (unidentified)	0.677	0.677	100.0%	0.001	0.001	100.0%
Shark (unidentified)	5.489	5.443	99.2%	0.764	0.757	99.1%
Shrimp (unidentified)	0.023	0.023	100.0%	0.010	0.010	100.0%
Sixgill shark	--	--	--	0.088	0.088	100.0%
Slickhead (unidentified)	0.128	0.128	100.0%	0.044	0.044	100.0%
Smelt (unidentified)	0.004	0.004	100.0%	--	--	--
Snailfish (unidentified)	0.891	0.891	100.0%	0.040	0.040	100.0%
Snakehead eelpout	0.007	0.007	100.0%	0.001	0.001	100.0%
Snipe eel (unidentified)	0.000	0.000	100.0%	--	--	--
Spiky king crab	--	--	--	0.001	0.001	100.0%
Spiny king crab	--	--	--	0.027	0.027	100.0%
Spiny lithode crab	0.314	0.314	100.0%	0.001	0.001	100.0%

Table 3a continued.

	NORTH of 40°10' N			SOUTH of 40°10' N		
	Total catch (mt)	Discard (mt)	Total % discarded	Total catch (mt)	Discard (mt)	Total % discarded
Non-groundfish species (cont.)						
Squid (unidentified)	14.510	9.211	63.5%	5.796	3.976	68.6%
Stone coral	0.268	0.268	100.0%	--	--	--
Sturgeon poacher	0.000	0.000	100.0%	--	--	--
Surfperch (unidentified)	0.000	0.000	100.0%	0.043	0.043	100.0%
Tanner crab (unidentified)	5.639	5.639	100.0%	1.499	1.499	100.0%
Tanneri tanner crab	78.372	78.372	100.0%	22.944	22.944	100.0%
Threadfin sculpin	--	--	--	0.001	0.001	100.0%
Threadfin slickhead	0.215	0.215	100.0%	0.009	0.009	100.0%
Tubeshoulder (unidentified)	0.005	0.005	100.0%	0.409	0.409	100.0%
Twoline eelpout	0.536	0.536	100.0%	0.134	0.134	100.0%
Urchin (unidentified)	1.728	1.728	100.0%	0.032	0.032	100.0%
Viperfish (unidentified)	0.002	0.002	100.0%	0.000	0.000	100.0%
White croaker	--	--	--	0.276	0.178	64.4%
Wolf-eel	0.019	0.012	64.6%	0.010	0.010	100.0%
Wrymouth (unidentified)	0.000	0.000	100.0%	--	--	--

Table 3b. Observed catch weight (mt), discard weight (mt), and percent discarded from observed vessels in the January through April 2009 limited entry groundfish bottom trawl fishery by management area. Rebuilding, non-rebuilding, and non-groundfish species are presented alphabetically. Retained weights were grouped when species-specific information was unavailable or grouped on fish tickets and did not allow for a species-specific comparison of total catch versus discard.

	NORTH of 40°10' N			SOUTH of 40°10' N		
	Total catch (mt)	Discard (mt)	Total % discarded	Total catch (mt)	Discard (mt)	Total % discarded
Rebuilding species						
Bocaccio *	0.00	0.00	7.9%	0.46	0.27	57.3%
Canary rockfish	0.11	0.07	65.4%	0.00	0.00	100.0%
Cowcod *	--	--	--	0.00	0.00	100.0%
Darkblotched rockfish *	24.53	14.52	59.2%	0.63	0.01	0.9%
Pacific ocean perch *	12.83	5.88	45.9%	0.00	0.00	0.0%
Widow rockfish	0.71	0.34	47.8%	0.12	0.12	100.0%
Yelloweye rockfish *	0.00	0.00	0.0%	--	--	--
Non-rebuilding species						
Arrowtooth flounder	383.28	43.67	11.4%	0.71	0.70	98.9%
Big skate	1.37	1.34	97.7%	--	--	--
Black rockfish	0.00	0.00	100.0%	--	--	--
Bronzespotted rockfish	0.00	0.00	100.0%	--	--	--
Butter sole	0.05	0.00	0.0%	--	--	--
California skate	0.01	0.01	100.0%	0.03	0.03	100.0%
Chilipepper rockfish	0.23	0.14	62.1%	5.92	0.01	0.1%
Dover sole	1009.95	32.42	3.2%	48.66	11.08	22.8%
English sole	18.79	3.72	19.8%	2.20	0.30	13.6%
Flatfish	18.04	11.83	65.6%	0.85	0.76	89.7%
Curlfin turbot		0.00			--	
Deepsea sole		2.45			0.72	
Flathead sSole		0.00			--	
Greenland turbot		0.00			--	
Hornyhead turbot		--			0.00	
Pacific sanddab		6.08			0.01	
Slender sole		0.45			0.03	
Unspecified flatfish		1.00			--	
Unspecified sanddab		1.86			0.00	
Flathead sole	0.10	0.10	100.0%	--	--	--
Grenadier	20.11	16.93	84.2%	4.32	2.82	65.2%
California grenadier		0.36			0.28	
Giant grenadier		10.80			0.88	
Pacific Grenadier		5.18			1.26	
Popeye Grenadier		0.00			--	
Smooth Grenadier		0.00			--	
Unspecified grenadier		0.58			0.40	
Kelp greenling	0.01	0.01	100.0%	--	--	--
Lingcod	6.75	1.53	22.7%	0.48	0.00	0.5%
Other groundfish	0.00	0.00	100.0%	0.06	0.06	100.0%
Other unspecified rockfish	--	--	--	0.01	0.00	0.0%
Pacific cod	11.05	0.03	0.2%	--	--	--
Pacific hake	17.25	17.25	100.0%	5.59	5.59	100.0%

* Mislabeling or grouping of these species on non-distributed fish tickets may cause retained catch weights to be underestimated.

Table 3b continued.

	NORTH of 40°10' N			SOUTH of 40°10' N		
	Total catch (mt)	Discard (mt)	Total % discarded	Total catch (mt)	Discard (mt)	Total % discarded
Non-rebuilding species (cont.)						
Petrale sole	172.24	5.80	3.4%	25.47	0.07	0.3%
Rex sole	35.29	3.37	9.5%	1.40	0.37	26.2%
Rock sole	0.00	0.00	100.0%	--	--	--
Rosy rockfish	0.03	0.03	100.0%	--	--	--
Sablefish	202.19	11.70	5.8%	23.42	0.50	2.1%
Sand sole	0.06	0.01	14.7%	--	--	--
Shelf rockfish	7.46	0.88	11.7%	3.42	0.11	3.1%
Chameleon rockfish		0.00			--	
Greenstriped rockfish		0.09			0.01	
Redstripe rockfish		0.04			0.00	
Rosethorn rockfish		0.32			0.02	
Silvergray rockfish		0.02			--	
Stripetail rockfish		0.02			0.08	
Unspecified shelf rockfish		0.37			0.00	
Skates	130.25	40.35	31.0%	9.39	9.21	98.0%
Aleutian skate		0.38			0.01	
Black skate		3.83			0.92	
Deepsea skate		0.11			--	
Longnose skate		29.37			7.30	
Sandpaper skate		6.56			0.97	
Unspecified skate		0.12			0.01	
Slope rockfish	21.78	14.11	64.8%	30.29	8.94	29.5%
Aurora rockfish		1.39			0.10	
Bank rockfish		0.00			0.00	
Blackgill rockfish		0.21			0.00	
Redbanded rockfish		0.32			0.02	
Rougheye rockfish		5.04			--	
Sharpchin rockfish		0.58			0.05	
Shortraker rockfish		1.51			0.00	
Shortraker/rougheye rockfish		0.16			--	
Splitnose rockfish		4.42			7.98	
Yellowmouth rockfish		0.01			--	
Unspecified slope rockfish		0.46			0.79	
Spiny dogfish	71.70	71.70	100.0%	3.74	3.74	100.0%
Spotted ratfish	6.23	6.23	100.0%	0.80	0.80	100.0%
Swordspine rockfish	0.00	0.00	100.0%	--	--	--
Thornyheads	229.13	38.47	16.8%	27.94	5.31	19.0%
Longspine thornyhead		31.95			4.84	
Shortspine thornyhead		3.96			0.15	
Mixed thornyheads		2.57			0.32	
Yellowtail rockfish	1.43	0.22	15.4%	--	--	--
Non-groundfish species						
American shad	0.097	0.097	100.0%	0.006	0.006	100.0%
Anchovy (unidentified)	0.000	0.000	100.0%	--	--	--
Armored box crab	--	--	--	0.003	0.003	100.0%
Bairdi tanner crab	0.000	0.000	100.0%	--	--	--
Bearded eelpout	--	--	--	0.000	0.000	100.0%
Bigfin eelpout	0.133	0.133	100.0%	0.018	0.018	100.0%
Bigscale (unidentified)	0.000	0.000	100.0%	--	--	--

Table 3b continued.

	NORTH of 40°10' N			SOUTH of 40°10' N		
	Total catch (mt)	Discard (mt)	Total % discarded	Total catch (mt)	Discard (mt)	Total % discarded
Non-groundfish species (cont.)						
Black eelpout	0.002	0.002	100.0%	0.000	0.000	100.0%
Blob sculpin	0.027	0.027	100.0%	0.022	0.022	100.0%
Brown box crab	0.003	0.003	100.0%	0.001	0.001	100.0%
Brown cat shark	3.657	3.657	100.0%	1.031	1.031	100.0%
California halibut	0.008	0.008	100.0%	--	--	--
California king crab	--	--	--	0.000	0.000	100.0%
California slickhead	2.168	2.168	100.0%	0.889	0.889	100.0%
Crab (unidentified)	0.003	0.003	100.0%	0.001	0.001	100.0%
Daggertooth	0.002	0.002	100.0%	0.004	0.004	100.0%
Decorator/spider crab (unidentified)	0.001	0.001	100.0%	0.000	0.000	100.0%
Dragonfish (unidentified)	0.000	0.000	100.0%	--	--	--
Dungeness crab	3.064	3.064	100.0%	0.203	0.203	100.0%
Eelpout (unidentified)	2.320	2.320	100.0%	0.477	0.477	100.0%
Fangtooth	0.000	0.000	100.0%	--	--	--
Filetail cat shark	--	--	--	0.051	0.051	100.0%
Green sturgeon	0.091	0.091	100.0%	--	--	--
Gunnel (unidentified)	0.000	0.000	100.0%	--	--	--
Hagfish (unidentified)	0.002	0.002	100.0%	--	--	--
Hair crab	0.016	0.016	100.0%	--	--	--
Hermit crab (unidentified)	0.003	0.003	100.0%	0.000	0.000	100.0%
Jellyfish (unidentified)	0.107	0.107	100.0%	0.020	0.020	100.0%
King (Chinook) salmon	0.076	0.076	100.0%	--	--	--
King crab (unidentified)	0.006	0.006	100.0%	0.003	0.003	100.0%
King of the salmon	0.016	0.016	100.0%	--	--	--
Lancetfish (unidentified)	0.027	0.027	100.0%	0.002	0.002	100.0%
Laternfish (unidentified)	0.004	0.004	100.0%	0.000	0.000	100.0%
Long-armed spider crab	0.000	0.000	100.0%	--	--	--
Longnose lancetfish	0.015	0.015	100.0%	--	--	--
Longspine combfish	--	--	--	0.001	0.001	100.0%
Lyre crab (unidentified)	0.000	0.000	100.0%	--	--	--
Mackeral (unidentified)	0.002	0.002	100.0%	--	--	--
Midshipman (unidentified)	0.019	0.019	100.0%	--	--	--
Octopus (unidentified)	0.494	0.494	100.0%	0.059	0.059	100.0%
Other nongroundfish	1.006	0.960	95.5%	--	--	--
Pacific flatnose	0.666	0.666	100.0%	0.458	0.458	100.0%
Pacific hagfish	0.000	0.000	100.0%	--	--	--
Pacific halibut	44.923	44.919	100.0%	0.367	0.367	100.0%
Pacific herring	0.000	0.000	100.0%	--	--	--
Pacific lamprey	0.000	0.000	100.0%	--	--	--
Pacific sandlance	0.007	0.007	100.0%	--	--	--
Pacific sardine	0.001	0.001	100.0%	--	--	--
Pacific scabbardfish	0.002	0.002	100.0%	0.004	0.004	100.0%
Pacific sleeper shark	0.335	0.335	100.0%	0.123	0.123	100.0%
Pacific staghorn sculpin	--	--	--	0.000	0.000	100.0%
Paperbone (unidentified)	0.001	0.001	100.0%	--	--	--
Pink surfperch	--	--	--	0.001	0.001	100.0%
Poacher (unidentified)	0.008	0.008	100.0%	--	--	--
Ragfish	0.034	0.034	100.0%	--	--	--
Scarlet king crab	0.035	0.035	100.0%	0.003	0.003	100.0%

Table 3b continued.

	NORTH of 40°10' N			SOUTH of 40°10' N		
	Total catch (mt)	Discard (mt)	Total % discarded	Total catch (mt)	Discard (mt)	Total % discarded
Non-groundfish species (cont.)						
Sculpin (unidentified)	0.039	0.039	100.0%	--	--	--
Sea cucumber (unidentified)	0.158	0.158	100.0%	0.000	0.000	100.0%
Sevengill shark	0.015	0.015	100.0%	--	--	--
Shark (unidentified)	0.898	0.898	100.0%	0.054	0.054	100.0%
Shrimp (unidentified)	0.003	0.003	100.0%	0.003	0.003	100.0%
Sixgill shark	--	--	--	0.021	0.021	100.0%
Slickhead (unidentified)	0.014	0.014	100.0%	0.002	0.002	100.0%
Snailfish (unidentified)	0.405	0.405	100.0%	0.040	0.040	100.0%
Snakehead eelpout	0.001	0.001	100.0%	--	--	--
Spiny king crab	--	--	--	0.001	0.001	100.0%
Spiny lithode crab	0.001	0.001	100.0%	--	--	--
Squid (unidentified)	0.304	0.304	100.0%	0.121	0.121	100.0%
Stone coral	0.021	0.021	100.0%	--	--	--
Surf smelt	0.001	0.001	100.0%	--	--	--
Surfperch (unidentified)	0.006	0.006	100.0%	--	--	--
Tanner crab (unidentified)	4.805	4.805	100.0%	--	--	--
Tanneri tanner crab	41.027	41.027	100.0%	8.776	8.225	93.7%
Threadfin sculpin	--	--	--	0.000	0.000	100.0%
Threadfin slickhead	0.158	0.158	100.0%	0.004	0.004	100.0%
Tubeshoulder (unidentified)	0.015	0.015	100.0%	0.006	0.006	100.0%
Twoline eelpout	0.235	0.235	100.0%	0.068	0.068	100.0%
Urchin (unidentified)	0.152	0.152	100.0%	0.003	0.003	100.0%
Viperfish (unidentified)	0.001	0.001	100.0%	--	--	--
Walleye pollock	0.001	0.001	100.0%	--	--	--
White croaker	--	--	--	0.000	0.000	100.0%

Table 4a. Discard ratios and standard errors from observed trips north of 40°10' N latitude in the 2008 limited-entry bottom trawl fishery by season and depth. Ratios are computed as the observed discard weight divided by the observed weight (adjusted to fish tickets) of retained FMP groundfish species (excluding Pacific hake). Winter season is January-April and November-December and summer season is May-October. Species are grouped according to Appendix C. **Columns with darker shading signify that data were combined across more than one depth interval.**

NORTH OF 40°10' N Lat.		Depth interval (fathoms)					
		0-125		126-250		≥ 250	
		Discard ratio	SE	Discard ratio	SE	Discard ratio	SE
Rebuilding species	**Season**	***Denominator = Retained groundfish (mt)***					
Bocaccio	winter			0.0000	0.0050	0.0000	NA
	summer	0.0000	NA	0.0000	0.0596	0.0000	NA
Canary rockfish	winter			0.0025	1.8324	0.0000	NA
	summer	0.0011	0.0215	0.0002	0.0215	0.0000	0.0184
Darkblotched rockfish	winter			0.0187	0.0748	0.0004	0.0065
	summer	0.0002	0.0080	0.0066	0.0468	0.0003	0.0039
Pacific ocean perch	winter			0.0037	0.0442	0.0001	0.0043
	summer	0.0002	0.1822	0.0045	0.0443	0.0001	0.0018
Widow rockfish	winter			0.0007	0.0512	0.0000	0.0002
	summer	0.0000	0.1097	0.0000	0.0040	0.0000	0.0004
Yelloweye rockfish	winter			0.0000	NA	0.0000	NA
	summer	0.0000	0.0132	0.0000	0.0035	0.0000	NA
Non-rebuilding species		***Denominator = Retained groundfish (mt)***					
Arrowtooth flounder	winter			0.0419	0.1770	0.0093	0.0450
	summer	0.1508	0.2767	0.0179	0.0622	0.0070	0.0409
Big skate	winter			0.0021	0.4779	0.0001	0.0349
	summer	0.0261	0.2079	0.0011	0.4684	0.0001	0.0480
Black rockfish (North of 46° 16' N. lat.)	winter			0.0000	NA	0.0000	NA
	summer	0.0000	NA	0.0000	NA	0.0000	NA
Black rockfish (South of 46° 16' N. lat.)	winter			0.0000	NA	0.0000	NA
	summer	0.0000	0.0015	0.0000	NA	0.0000	NA
Chilipepper	winter			0.0000	0.0405	0.0000	0.0029
	summer	0.0000	NA	0.0000	0.3337	0.0000	NA
Dover sole	winter			0.0224	0.1356	0.0263	0.0974
	summer	0.0162	0.0672	0.0010	0.0062	0.0294	0.1146
English sole	winter			0.0008	0.0119	0.0000	0.0006
	summer	0.0270	0.0699	0.0000	0.0013	0.0000	0.0001
Kelp greenling	winter			0.0000	NA	0.0000	NA
	summer	0.0000	0.0013	0.0000	NA	0.0000	NA
Lingcod	winter			0.0035	0.0549	0.0000	0.0020
	summer	0.0315	0.1478	0.0005	0.0201	0.0000	NA
Longnose skate	winter			0.0278	0.0803	0.0081	0.0336
	summer	0.0528	0.2356	0.0118	0.0333	0.0057	0.0277
Longspine thornyhead	winter			0.0003	0.0023	0.0069	0.0165
	summer	0.0000	NA	0.0010	0.0049	0.0226	0.0414
Mixed thornyheads	winter			0.0000	0.0153	0.0024	0.1536
	summer	0.0000	NA	0.0000	0.0067	0.0003	0.0807
Other flatfish	winter			0.0029	0.0074	0.0003	0.0048
	summer	0.0589	0.0522	0.0006	0.0025	0.0006	0.0045
Other groundfish	winter			0.0061	0.0329	0.0010	0.0350
	summer	0.0356	0.1237	0.0063	0.0328	0.0011	0.0668
Other nearshore rockfish	winter			0.0000	NA	0.0000	NA
	summer	0.0000	0.0052	0.0000	NA	0.0000	NA
Other shelf rockfish	winter			0.0005	0.0068	0.0000	0.0014
	summer	0.0006	0.0098	0.0009	0.0168	0.0000	0.0039
Other slope rockfish	winter			0.0051	0.0108	0.0008	0.0061
	summer	0.0002	0.0234	0.0116	0.0148	0.0021	0.0059

Table 4a continued.

NORTH OF 40°10' N Lat.		Depth interval (fathoms) 0-125		126-250		≥ 250	
		Discard ratio	SE	Discard ratio	SE	Discard ratio	SE
Non-rebuilding species (cont.)	**Season**	***Denominator = Retained groundfish (mt)***					
Pacific cod (North of 43° N. lat.)	winter			0.0000	0.0004	0.0000	NA
	summer	0.0001	0.0013	0.0000	0.0012	0.0000	NA
Pacific hake	winter			0.0727	0.3056	0.0134	0.0678
	summer	0.0989	1.0227	0.0868	0.2062	0.0356	0.1536
Petrale sole	winter			0.0049	0.0493	0.0001	0.0038
	summer	0.0093	0.0154	0.0000	0.0005	0.0000	0.0001
Redstripe rockfish	winter			0.0000	NA	0.0000	NA
	summer	0.0000	NA	0.0000	0.0052	0.0000	0.0047
Sablefish	winter			0.0060	0.0248	0.0076	0.0208
	summer	0.0042	0.0276	0.0065	0.0268	0.0068	0.0316
Sharpchin rockfish	winter			0.0003	0.0459	0.0000	0.0010
	summer	0.0000	NA	0.0005	0.0999	0.0000	0.0008
Shortbelly rockfish	winter			0.0000	NA	0.0000	NA
	summer	0.0000	NA	0.0000	NA	0.0000	NA
Shortspine thornyhead	winter			0.0024	0.0079	0.0006	0.0012
	summer	0.0000	0.0003	0.0047	0.0108	0.0022	0.0049
Silvergray rockfish	winter			0.0004	0.1453	0.0000	0.0109
	summer	0.0000	NA	0.0000	0.0412	0.0000	NA
Spiny dogfish	winter			0.0968	0.2913	0.0059	0.0959
	summer	0.2278	1.2702	0.0129	0.1251	0.0033	0.2131
Splitnose rockfish	winter			0.0095	0.0654	0.0002	0.0114
	summer	0.0002	0.1600	0.0060	0.0566	0.0013	0.1039
Starry flounder	winter			0.0000	NA	0.0000	NA
	summer	0.0009	0.0092	0.0000	NA	0.0000	NA
Unspecified grenadiers	winter			0.0001	0.0172	0.0115	0.0325
	summer	0.0000	NA	0.0003	0.0089	0.0205	0.0385
Unspecified skate	winter			0.0050	0.0067	0.0046	0.0064
	summer	0.0045	0.0139	0.0053	0.0055	0.0039	0.0042
Yellowmouth rockfish	winter			0.0000	NA	0.0000	NA
	summer	0.0000	NA	0.0000	0.0087	0.0000	NA
Yellowtail rockfish	winter			0.0000	0.0226	0.0000	NA
	summer	0.0002	0.0060	0.0001	0.0096	0.0000	NA
Non-groundfish species		***Denominator = Retained groundfish (mt)***					
Dungeness crab	winter			0.0005	0.0279	0.0000	0.0024
	summer	0.1206	0.2020	0.0001	0.0095	0.0000	0.0041
Other non-FMP flatfish	winter			0.0008	0.0108	0.0016	0.0073
	summer	0.0040	0.0321	0.0003	0.0017	0.0031	0.0089
Other nongroundfish	winter			0.0065	0.0094	0.0081	0.0039
	summer	0.0052	0.0339	0.0100	0.0070	0.0173	0.0081
Tanner crab	winter			0.0018	0.0141	0.0361	0.0621
	summer	0.0000	NA	0.0024	0.0110	0.0376	0.0555

Table 4b. Discard ratios and standard errors from observed trips south of 40° 10’ N latitude in the 2008 limited entry groundfish bottom trawl fishery by season and depth. Ratios are computed as the observed discard weight divided by the observed weight (adjusted to fish tickets) of retained FMP groundfish species (excluding Pacific hake). Winter season is January-April and November-December and summer season is May-October. Species are grouped according to Appendix C.

SOUTH OF 40°10' N Lat.		**Depth interval (fathoms)**					
		0-125		**126-250**		**≥ 250**	
		Discard ratio	SE	Discard ratio	SE	Discard ratio	SE
Rebuilding species	**Season**	***Denominator = Retained groundfish (mt)***					
Bocaccio	winter	0.0008	NA	0.0001	NA	0.0000	NA
	summer	0.0126	0.2440	0.0012	0.0551	0.0000	NA
Canary rockfish	winter	0.0000	NA	0.0000	NA	0.0000	NA
	summer	0.0002	0.0043	0.0000	NA	0.0000	NA
Cowcod	winter	0.0000	NA	0.0000	NA	0.0000	NA
	summer	0.0005	0.3228	0.0000	NA	0.0000	NA
Darkblotched rockfish	winter	0.0001	0.0027	0.0002	0.0068	0.0000	NA
	summer	0.0001	0.0075	0.0005	0.0068	0.0000	NA
Widow rockfish	winter	0.0001	NA	0.0000	NA	0.0000	NA
	summer	0.0007	0.1340	0.0010	0.3430	0.0000	NA
Yelloweye rockfish	winter	0.0000	NA	0.0000	NA	0.0000	NA
	summer	0.0000	NA	0.0000	NA	0.0000	NA
Non-rebuilding species		***Denominator = Retained groundfish (mt)***					
Arrowtooth flounder	winter	0.0009	0.0093	0.0099	0.1176	0.0020	0.3990
	summer	0.0018	0.0551	0.0023	0.0536	0.0003	0.0361
Bank rockfish	winter	0.0000	NA	0.0000	NA	0.0000	NA
	summer	0.0000	NA	0.0001	0.0098	0.0000	NA
Big skate	winter	0.0186	0.4123	0.0001	NA	0.0000	NA
	summer	0.0021	0.3084	0.0000	NA	0.0000	NA
Black rockfish	winter	0.0000	NA	0.0000	NA	0.0000	NA
	summer	0.0000	NA	0.0000	NA	0.0000	NA
Blackgill rockfish	winter	0.0000	NA	0.0000	0.0003	0.0000	NA
	summer	0.0000	0.0067	0.0001	0.0028	0.0000	0.0003
Chilipepper	winter	0.0008	0.0058	0.0023	0.0949	0.0000	NA
	summer	0.1401	0.6611	0.0032	0.0586	0.0000	NA
Dover sole	winter	0.0047	0.0565	0.0145	0.0784	0.0946	0.3216
	summer	0.0128	0.0475	0.0255	0.1318	0.0675	0.3107
English sole	winter	0.0012	0.0089	0.0060	0.0833	0.0000	NA
	summer	0.0514	0.0964	0.0008	0.0565	0.0000	NA
Kelp greenling	winter	0.0000	NA	0.0000	NA	0.0000	NA
	summer	0.0000	NA	0.0000	NA	0.0000	NA
Lingcod	winter	0.0061	0.0594	0.0000	NA	0.0000	NA
	summer	0.0219	0.3080	0.0025	0.0862	0.0000	NA
Longnose skate	winter	0.2729	2.1585	0.1269	0.6342	0.0075	0.1109
	summer	0.1284	0.3479	0.1020	0.4385	0.0277	0.1621
Longspine thornyhead	winter	0.0000	NA	0.0009	0.0263	0.0476	0.0994
	summer	0.0000	NA	0.0081	0.3487	0.0155	0.0927
Mixed thornyheads	winter	0.0000	NA	0.0000	NA	0.0002	NA
	summer	0.0000	NA	0.0000	NA	0.0000	NA
Other flatfish	winter	0.0071	0.0270	0.0077	0.0447	0.0000	0.0013
	summer	0.1191	0.1715	0.0066	0.0368	0.0005	0.0082
Other groundfish	winter	0.0143	0.2336	0.0254	0.2981	0.0027	0.3694
	summer	0.0550	0.3478	0.0478	0.6152	0.0008	0.0199
Other nearshore rockfish	winter	0.0000	NA	0.0000	NA	0.0000	NA
	summer	0.0000	0.0052	0.0000	NA	0.0000	NA
Other shelf rockfish	winter	0.0042	0.0268	0.0004	0.0127	0.0000	NA
	summer	0.0476	0.8608	0.0102	0.0764	0.0000	NA

Table 4b continued.

SOUTH OF 40°10' N Lat.		Depth interval (fathoms) 0-125		126-250		≥ 250	
		Discard ratio	SE	Discard ratio	SE	Discard ratio	SE
Non-rebuilding species (cont.)	**Season**	***Denominator = Retained groundfish (mt)***					
Other slope rockfish	winter	0.0000	NA	0.0024	0.0137	0.0000	NA
	summer	0.0001	0.0037	0.0050	0.0298	0.0022	0.0164
Pacific hake	winter	0.0005	0.0107	0.0750	0.6185	0.0040	0.2932
	summer	0.0389	0.2573	0.1070	1.2592	0.0253	0.1658
Petrale sole	winter	0.0038	0.0250	0.0032	0.0235	0.0000	0.0013
	summer	0.0163	0.0469	0.0001	0.0022	0.0000	NA
Sablefish	winter	0.0002	0.0066	0.0060	0.1035	0.0111	0.0854
	summer	0.0013	0.0421	0.0499	0.5950	0.0096	0.0730
Sharpchin rockfish	winter	0.0000	NA	0.0000	NA	0.0000	NA
	summer	0.0000	NA	0.0000	NA	0.0000	NA
Shortbelly rockfish	winter	0.0000	NA	0.0002	NA	0.0000	NA
	summer	0.0003	0.0337	0.0149	0.2654	0.0000	NA
Shortspine thornyhead	winter	0.0000	NA	0.0015	0.0098	0.0004	0.0050
	summer	0.0002	0.0326	0.0009	0.0052	0.0004	0.0023
Spiny dogfish	winter	0.0062	0.0601	0.0147	0.1950	0.0002	0.0660
	summer	0.1121	0.6317	0.0374	0.2864	0.0002	0.0168
Splitnose rockfish	winter	0.0000	NA	0.0494	0.4458	0.0001	0.0044
	summer	0.0004	0.0218	0.1609	0.8763	0.0006	0.0073
Starry flounder	winter	0.0000	NA	0.0000	NA	0.0000	NA
	summer	0.0000	NA	0.0000	NA	0.0000	NA
Unspecified grenadiers	winter	0.0000	NA	0.0001	0.0195	0.0745	0.1839
	summer	0.0000	NA	0.0001	0.0059	0.0324	0.1311
Unspecified skate	winter	0.0005	0.0088	0.0165	0.0985	0.0199	0.0947
	summer	0.0177	0.0404	0.0292	0.1240	0.0072	0.0209
Yellowtail rockfish	winter	0.0000	NA	0.0000	NA	0.0000	NA
	summer	0.0001	0.0226	0.0000	NA	0.0000	NA
Non-rebuilding species	**Season**	***Denominator = Retained groundfish (mt)***					
Dungeness crab	winter	0.0236	0.2089	0.0087	0.4473	0.0000	NA
	summer	0.0493	0.1771	0.0002	0.0150	0.0000	NA
Other non-FMP flatfish	winter	0.0114	0.1428	0.0001	0.0050	0.0146	0.0632
	summer	0.0011	0.0076	0.0010	0.0204	0.0041	0.0318
Other nongroundfish	winter	0.0044	0.0196	0.0776	0.4273	0.0458	0.0285
	summer	0.0109	0.0099	0.0119	0.0381	0.0258	0.0227
Tanner crab	winter	0.0000	NA	0.0101	0.1032	0.0721	0.2031
	summer	0.0001	0.0325	0.0158	0.2192	0.0994	0.2876

Table 5a. Discard ratios and standard errors from observed trips north of 40°10' N latitude in the 2008 limited-entry bottom trawl fishery by season and depth. Ratios are computed as the observed discard weight (lbs) divided by the observed tow duration (hrs). Winter season is January-April and November-December and summer season is May-October. Species are grouped according to Appendix C. **Columns with darker shading signify that data were combined across more than one depth interval.**

NORTH OF 40°10' N Lat.		Depth interval (fathoms)					
		0-125		126-250		≥ 250	
		Discard ratio	SE	Discard ratio	SE	Discard ratio	SE
Rebuilding species	**Season**	***Denominator = Tow duration (hrs)***					
Bocaccio	winter			0.0081	0.1941	0.0000	NA
	summer	0.0065	NA	0.0285	2.0940	0.0000	NA
Canary rockfish	winter			2.4116	71.6953	0.0010	NA
	summer	0.6447	0.6049	0.1437	0.7548	0.0231	0.4430
Darkblotched rockfish	winter			18.2163	2.8403	0.3872	0.2584
	summer	0.1120	0.2245	5.9260	1.6401	0.1813	0.0936
Pacific ocean perch	winter			3.5755	1.7170	0.0848	0.1705
	summer	0.0909	5.1420	4.0373	1.5548	0.0404	0.0426
Widow rockfish	winter			0.6512	1.9996	0.0008	0.0096
	summer	0.0185	3.0964	0.0335	0.1394	0.0007	0.0107
Yelloweye rockfish	winter			0.0000	NA	0.0000	NA
	summer	0.0163	0.3665	0.0038	0.1250	0.0000	NA
Non-rebuilding species		***Denominator = Tow duration (hrs)***					
Arrowtooth flounder	winter			40.8878	6.8047	8.0435	1.7625
	summer	85.6858	7.1950	16.1580	2.1467	3.8378	0.9743
Big skate	winter			2.0574	18.6292	0.0460	1.3866
	summer	14.8272	5.6738	1.0116	16.5059	0.0584	1.1559
Black rockfish (North of 46° 16' N. lat.)	winter			0.0000	NA	0.0000	NA
	summer	0.0000	NA	0.0000	NA	0.0000	NA
Black rockfish (South of 46° 16' N. lat.)	winter			0.0000	NA	0.0000	NA
	summer	0.0020	0.0427	0.0000	NA	0.0000	NA
Chilipepper	winter			0.0469	1.5862	0.0010	0.1161
	summer	0.0000	NA	0.0386	11.7818	0.0000	NA
Dover sole	winter			21.8999	5.2394	22.8151	3.8369
	summer	9.1811	1.8829	0.8820	0.2180	16.1869	2.7355
English sole	winter			0.8117	0.4629	0.0149	0.0252
	summer	15.3283	1.9228	0.0196	0.0462	0.0003	0.0019
Kelp greenling	winter			0.0000	NA	0.0000	NA
	summer	0.0009	0.0360	0.0000	NA	0.0000	NA
Lingcod	winter			3.4475	2.1343	0.0321	0.0781
	summer	17.9073	4.1162	0.4803	0.7078	0.0000	NA
Longnose skate	winter			27.1084	2.8506	7.0309	1.2819
	summer	30.0098	6.4137	10.6070	1.1255	3.1634	0.6483
Longspine thornyhead	winter			0.2532	0.0899	5.9428	0.6390
	summer	0.0000	NA	0.9046	0.1667	12.4357	0.9682
Mixed thornyheads	winter			0.0114	0.6005	2.0531	6.1069
	summer	0.0000	NA	0.0168	0.2350	0.1550	1.9445
Other flatfish	winter			2.8230	0.2779	0.2393	0.1916
	summer	33.4874	1.4200	0.5037	0.0877	0.3071	0.1081
Other groundfish	winter			5.9940	1.2252	0.8352	1.3915
	summer	20.2129	3.3511	5.6673	1.1094	0.5862	1.6082
Other nearshore rockfish	winter			0.0000	NA	0.0000	NA
	summer	0.0196	0.1454	0.0000	NA	0.0000	NA
Other shelf rockfish	winter			0.5119	0.2643	0.0153	0.0574
	summer	0.3378	0.2755	0.7661	0.5925	0.0222	0.0934
Other slope rockfish	winter			4.9975	0.4041	0.6965	0.2411
	summer	0.0989	0.6605	10.4091	0.5021	1.1694	0.1404

Table 5a continued.

NORTH OF 40°10' N Lat.		Depth interval (fathoms) 0-125		126-250		≥ 250	
		Discard ratio	SE	Discard ratio	SE	Discard ratio	SE
Non-rebuilding species (cont.)	**Season**	***Denominator = Tow duration (hrs)***					
Pacific cod (North of 43° N. lat.)	winter			0.0010	0.0146	0.0000	NA
	summer	0.0443	0.0369	0.0026	0.0417	0.0000	NA
Pacific hake	winter			70.9406	11.4656	11.6457	2.6215
	summer	56.1911	28.6265	78.1529	6.7554	19.6039	3.6047
Petrale sole	winter			4.7448	1.9226	0.1014	0.1536
	summer	5.2870	0.4143	0.0093	0.0178	0.0004	0.0012
Redstripe rockfish	winter			0.0406	NA	0.0003	NA
	summer	0.0000	NA	0.0101	0.1824	0.0052	0.1121
Sablefish	winter			5.8994	0.9458	6.5874	0.8092
	summer	2.3743	0.7726	5.8578	0.9324	3.7626	0.7565
Sharpchin rockfish	winter			0.2638	1.7949	0.0007	0.0414
	summer	0.0038	NA	0.4426	3.5204	0.0005	0.0190
Shortbelly rockfish	winter			0.0011	NA	0.0000	NA
	summer	0.0000	NA	0.0000	NA	0.0000	NA
Shortspine thornyhead	winter			2.3656	0.2960	0.4805	0.0480
	summer	0.0025	0.0097	4.2616	0.3693	1.2209	0.1148
Silvergray rockfish	winter			0.3502	5.6720	0.0039	0.4367
	summer	0.0011	NA	0.0134	1.4464	0.0000	NA
Spiny dogfish	winter			94.4475	10.4210	5.1151	3.8134
	summer	129.4688	35.2111	11.6550	4.3399	1.7969	5.1301
Splitnose rockfish	winter			9.2328	2.4864	0.1591	0.4517
	summer	0.0999	4.5101	5.3998	1.9752	0.7096	2.5052
Starry flounder	winter			0.0036	NA	0.0000	NA
	summer	0.5268	0.2550	0.0000	NA	0.0000	NA
Unspecified grenadiers	winter			0.1255	0.6684	9.9962	1.2479
	summer	0.0000	NA	0.2337	0.3106	11.2672	0.8965
Unspecified skate	winter			4.8603	0.2250	4.0201	0.2353
	summer	2.5761	0.3841	4.7983	0.1707	2.1478	0.0917
Yellowmouth rockfish	winter			0.0092	NA	0.0000	NA
	summer	0.0000	NA	0.0048	0.3068	0.0000	NA
Yellowtail rockfish	winter			0.0263	0.8827	0.0000	NA
	summer	0.1280	0.1695	0.0812	0.3391	0.0000	NA
Non-groundfish species		***Denominator = Tow duration (hrs)***					
Dungeness crab	winter			0.4937	1.0715	0.0017	0.0927
	summer	68.5549	5.1186	0.1022	0.3338	0.0009	0.0974
Other non-FMP flatfish	winter			0.8215	0.4144	1.4268	0.2737
	summer	2.2849	0.8773	0.2283	0.0569	1.7328	0.2028
Other nongroundfish	winter			6.3589	0.3486	7.0077	0.1373
	summer	2.9719	0.9505	9.0392	0.2314	9.4992	0.1861
Tanner crab	winter			1.7957	0.5197	31.2346	2.1485
	summer	0.0005	NA	2.1991	0.3694	20.7000	1.1865

Table 5b. Discard ratios and standard errors from observed trips north of 40° 10’ N latitude in the 2008 limited entry groundfish bottom trawl fishery by season and depth. Ratios are computed as the observed discard weight (lbs) divided by the observed tow duration (hrs) summarized in each strata. Winter season is January-April and November-December and summer season is May-October. Species are grouped according to Appendix C.

SOUTH OF 40°10' N Lat.		Depth interval (fathoms)					
		0-125		126-250		≥ 250	
		Discard ratio	SE	Discard ratio	SE	Discard ratio	SE
Rebuilding species	**Season**	***Denominator = Tow duration (hrs)***					
Bocaccio	winter	0.6341	NA	0.0440	NA	0.0000	NA
	summer	5.3283	5.2260	0.9095	1.9542	0.0000	NA
Canary rockfish	winter	0.0000	NA	0.0000	NA	0.0000	NA
	summer	0.0654	0.0935	0.0000	NA	0.0000	NA
Cowcod	winter	0.0000	NA	0.0000	NA	0.0000	NA
	summer	0.1924	7.0319	0.0361	NA	0.0000	NA
Darkblotched rockfish	winter	0.0417	0.0798	0.1001	0.1722	0.0000	NA
	summer	0.0504	0.1629	0.3633	0.2446	0.0000	NA
Widow rockfish	winter	0.0677	NA	0.0000	NA	0.0000	NA
	summer	0.3149	2.8662	0.7413	12.6035	0.0000	NA
Yelloweye rockfish	winter	0.0000	NA	0.0000	NA	0.0000	NA
	summer	0.0134	NA	0.0000	NA	0.0000	NA
Non-rebuilding species		***Denominator = Tow duration (hrs)***					
Arrowtooth flounder	winter	0.7360	0.1986	5.3038	2.3246	0.9523	9.3369
	summer	0.7641	1.1855	1.7268	1.9402	0.2047	1.0733
Bank rockfish	winter	0.0000	NA	0.0000	NA	0.0000	NA
	summer	0.0000	NA	0.0746	0.3603	0.0000	NA
Big skate	winter	15.0147	10.6780	0.0496	NA	0.0000	NA
	summer	0.8885	6.6562	0.0000	NA	0.0000	NA
Black rockfish	winter	0.0000	NA	0.0000	NA	0.0000	NA
	summer	0.0000	NA	0.0000	NA	0.0000	NA
Blackgill rockfish	winter	0.0000	NA	0.0056	0.0083	0.0000	NA
	summer	0.0085	0.1473	0.0656	0.0966	0.0025	0.0094
Chilipepper	winter	0.6228	0.1573	1.2400	2.4180	0.0000	NA
	summer	59.4674	13.7723	2.3549	2.1249	0.0000	NA
Dover sole	winter	3.7657	1.6149	7.7693	1.6468	44.0803	6.9266
	summer	5.4374	0.9702	18.9511	4.5297	43.2384	9.0950
English sole	winter	0.9752	0.2488	3.2371	1.9111	0.0000	NA
	summer	21.8141	1.8862	0.6190	2.0771	0.0000	NA
Kelp greenling	winter	0.0000	NA	0.0000	NA	0.0000	NA
	summer	0.0000	NA	0.0000	NA	0.0000	NA
Lingcod	winter	4.8962	1.6633	0.0000	NA	0.0000	NA
	summer	9.3101	6.6999	1.8639	3.1290	0.0000	NA
Longnose skate	winter	220.1200	41.9681	67.9512	9.6579	3.5059	2.4746
	summer	54.4675	6.3045	75.7031	13.1645	17.7523	4.7123
Longspine thornyhead	winter	0.0000	NA	0.4558	0.6406	22.1718	2.0517
	summer	0.0000	NA	5.9856	12.7956	9.8954	2.7539
Mixed thornyheads	winter	0.0000	NA	0.0000	NA	0.1118	NA
	summer	0.0037	NA	0.0000	NA	0.0000	NA
Other flatfish	winter	5.7405	0.6585	4.1131	0.8854	0.0138	0.0294
	summer	50.5421	3.3900	4.9019	1.2702	0.2991	0.2453
Other groundfish	winter	11.5389	7.1084	13.6299	6.8743	1.2614	8.5989
	summer	23.3308	7.3594	35.4802	22.0607	0.5171	0.5830
Other nearshore rockfish	winter	0.0000	NA	0.0000	NA	0.0000	NA
	summer	0.0022	0.1139	0.0000	NA	0.0000	NA
Other shelf rockfish	winter	3.3652	0.6525	0.1908	0.3154	0.0000	NA
	summer	20.1775	18.7754	7.5372	2.6906	0.0000	NA

Table 5b continued.

SOUTH OF 40°10' N Lat.		Depth interval (fathoms) 0-125		126-250		≥ 250	
		Discard ratio	SE	Discard ratio	SE	Discard ratio	SE
Non-rebuilding species (cont.)	**Season**	***Denominator = Tow duration (hrs)***					
Other slope rockfish	winter	0.0000	NA	1.2971	0.3276	0.0000	NA
	summer	0.0499	0.0808	3.7211	1.0696	1.3983	0.4837
Pacific hake	winter	0.4385	0.3109	40.1402	12.9200	1.8765	6.8218
	summer	16.5184	5.3803	79.4151	45.5025	16.1766	4.7223
Petrale sole	winter	3.0256	0.6784	1.7026	0.5437	0.0036	0.0293
	summer	6.9292	0.9769	0.0465	0.0812	0.0000	NA
Sablefish	winter	0.1903	0.1704	3.2249	2.6129	5.1572	1.9770
	summer	0.5452	0.9037	37.0271	21.6625	6.1380	2.1626
Sharpchin rockfish	winter	0.0000	NA	0.0000	NA	0.0000	NA
	summer	0.0000	NA	0.0000	NA	0.0000	NA
Shortbelly rockfish	winter	0.0113	NA	0.1098	NA	0.0000	NA
	summer	0.1177	0.7265	11.0452	8.6208	0.0000	NA
Shortspine thornyhead	winter	0.0000	NA	0.8141	0.2066	0.1691	0.1172
	summer	0.0809	0.7099	0.6896	0.1722	0.2776	0.0684
Spiny dogfish	winter	4.9966	1.1782	7.8503	4.2978	0.0961	1.5415
	summer	47.5755	13.3719	27.7315	9.6290	0.0987	0.4899
Splitnose rockfish	winter	0.0000	NA	26.4828	10.7409	0.0320	0.1024
	summer	0.1739	0.4728	119.4508	30.8913	0.3801	0.2168
Starry flounder	winter	0.0000	NA	0.0000	NA	0.0000	NA
	summer	0.0000	NA	0.0000	NA	0.0000	NA
Unspecified grenadiers	winter	0.0000	NA	0.0530	0.4881	34.7381	4.0016
	summer	0.0000	NA	0.0436	0.2078	20.7733	3.7257
Unspecified skate	winter	0.4009	0.1776	8.8164	1.6220	9.2787	2.0347
	summer	7.4950	0.8121	21.6625	4.0078	4.5918	0.5754
Yellowtail rockfish	winter	0.0000	NA	0.0000	NA	0.0000	NA
	summer	0.0366	0.4834	0.0000	NA	0.0000	NA
Non-rebuilding species	**Season**	***Denominator = Tow duration (hrs)***					
Dungeness crab	winter	19.0308	4.2033	4.6786	10.8802	0.0000	NA
	summer	20.9170	3.3570	0.1430	0.5237	0.0000	NA
Other non-FMP flatfish	winter	9.2159	3.7364	0.0544	0.1195	6.8232	1.2980
	summer	0.4599	0.1510	0.7672	0.7211	2.6512	0.8986
Other nongroundfish	winter	3.5115	0.5569	41.5348	10.5069	21.3528	0.5613
	summer	4.6145	0.1775	8.8494	1.3159	16.5276	0.6317
Tanner crab	winter	0.0000	NA	5.4244	2.1211	33.5936	3.6580
	summer	0.0216	0.7051	11.6959	7.4944	63.6372	7.6923

Table 6a. Bycatch ratios and standard errors from observed trips north of 40°10' N latitude in the 2008 limited-entry bottom trawl fishery by season and depth. Ratios are computed as the observed total catch weight divided by the observed weight (adjusted to fish tickets) of retained FMP groundfish species (excluding Pacific hake). Winter season is January-April and November-December and summer season is May-October. Species are grouped according to Appendix C. **Columns with darker shading signify that data were combined across more than one depth interval.**

NORTH OF 40°10' N Lat.		Depth interval (fathoms)					
		0-125		126-250		≥ 250	
		Bycatch ratio	SE	Bycatch ratio	SE	Bycatch ratio	SE
Rebuilding species	**Season**	***Denominator = Retained groundfish (mt)***					
Bocaccio	winter			0.0001	0.0100	0.0000	NA
	summer	0.0000	NA	0.0000	0.0596	0.0000	NA
Canary rockfish	winter			0.0025	1.8321	0.0000	NA
	summer	0.0014	0.0223	0.0002	0.0215	0.0000	0.0183
Darkblotched rockfish	winter			0.0261	0.0841	0.0029	0.0186
	summer	0.0002	0.0082	0.0127	0.0602	0.0030	0.0110
Pacific ocean perch	winter			0.0116	0.0702	0.0007	0.0160
	summer	0.0011	0.9739	0.0108	0.0561	0.0009	0.0223
Widow rockfish	winter			0.0009	0.0514	0.0001	0.0050
	summer	0.0000	0.1097	0.0001	0.0043	0.0000	0.0027
Yelloweye rockfish	winter			0.0000	0.0049	0.0000	0.0012
	summer	0.0000	0.0132	0.0000	0.0033	0.0000	0.0009
Non-rebuilding species		***Denominator = Retained groundfish (mt)***					
Arrowtooth flounder	winter			0.2478	0.5431	0.0846	0.3516
	summer	0.1921	0.4054	0.2535	0.5238	0.0710	0.4382
Big skate	winter			0.0021	0.4779	0.0001	0.0349
	summer	0.0275	0.2090	0.0011	0.4684	0.0001	0.0480
Black rockfish (North of 46° 16' N. lat.)	winter			0.0000	NA	0.0000	NA
	summer	0.0000	0.0036	0.0000	NA	0.0000	NA
Black rockfish (South of 46° 16' N. lat.)	winter			0.0000	NA	0.0000	NA
	summer	0.0000	0.0018	0.0000	NA	0.0000	NA
Chilipepper	winter			0.0001	0.0552	0.0000	0.0027
	summer	0.0000	NA	0.0000	0.3337	0.0000	NA
Dover sole	winter			0.3420	0.7975	0.6645	0.8315
	summer	0.4175	0.5488	0.4714	0.6103	0.4607	0.5177
English sole	winter			0.0255	0.1170	0.0010	0.0155
	summer	0.1264	0.2265	0.0008	0.0158	0.0004	0.0075
Kelp greenling	winter			0.0000	NA	0.0000	NA
	summer	0.0000	0.0011	0.0000	NA	0.0000	NA
Lingcod	winter			0.0108	0.0677	0.0007	0.0224
	summer	0.0421	0.1516	0.0072	0.1125	0.0009	0.2742
Longnose skate	winter			0.0376	0.0892	0.0137	0.0448
	summer	0.0530	0.2356	0.0259	0.0448	0.0097	0.0356
Longspine thornyhead	winter			0.0042	0.0376	0.0608	0.1062
	summer	0.0000	NA	0.0074	0.0353	0.1426	0.1645
Mixed thornyheads	winter			0.0005	0.2950	0.0068	0.3105
	summer	0.0001	0.4084	0.0044	0.3399	0.0105	1.1426
Other flatfish	winter			0.0263	0.0416	0.0102	0.0288
	summer	0.1832	0.1045	0.0253	0.0440	0.0185	0.0361
Other groundfish	winter			0.0062	0.0328	0.0010	0.0350
	summer	0.0356	0.1237	0.0063	0.0328	0.0011	0.0668
Other nearshore rockfish	winter			0.0000	NA	0.0000	NA
	summer	0.0000	0.0049	0.0000	NA	0.0000	NA
Other shelf rockfish	winter			0.0020	0.0250	0.0001	0.0033
	summer	0.0022	0.0339	0.0010	0.0171	0.0000	0.0039
Other slope rockfish	winter			0.0171	0.0247	0.0039	0.0191
	summer	0.0008	0.0680	0.0275	0.0201	0.0086	0.0157

Table 6a continued.

NORTH OF 40°10' N Lat.		Depth interval (fathoms) 0-125		126-250		≥ 250	
		Bycatch ratio	SE	Bycatch ratio	SE	Bycatch ratio	SE
Non-rebuilding species (cont.)	**Season**	***Denominator = Retained groundfish (mt)***					
Pacific cod (North of 43° N. lat.)	winter			0.0007	0.1350	0.0000	0.0017
	summer	0.0073	0.0956	0.0000	0.0086	0.0001	0.0042
Pacific hake	winter			0.0727	0.3056	0.0134	0.0678
	summer	0.0989	1.0227	0.0868	0.2062	0.0356	0.1536
Petrale sole	winter			0.2704	0.5080	0.0053	0.0803
	summer	0.1496	0.1560	0.0014	0.0321	0.0002	0.0051
Redstripe rockfish	winter			0.0000	NA	0.0000	NA
	summer	0.0000	NA	0.0000	0.0052	0.0000	0.0047
Sablefish	winter			0.0413	0.0800	0.1436	0.1812
	summer	0.0127	0.0633	0.1216	0.1519	0.2407	0.2256
Sharpchin rockfish	winter			0.0003	0.0459	0.0000	0.0010
	summer	0.0000	NA	0.0005	0.0999	0.0000	0.0008
Shortbelly rockfish	winter			0.0000	NA	0.0000	NA
	summer	0.0000	NA	0.0000	NA	0.0000	NA
Shortspine thornyhead	winter			0.0242	0.0499	0.0439	0.0501
	summer	0.0014	0.1058	0.0668	0.0684	0.0947	0.0784
Silvergray rockfish	winter			0.0004	0.1453	0.0000	0.0109
	summer	0.0000	NA	0.0000	0.0412	0.0000	NA
Spiny dogfish	winter			0.0968	0.2913	0.0105	0.2729
	summer	0.2278	1.2702	0.0129	0.1251	0.0033	0.2131
Splitnose rockfish	winter			0.0095	0.0654	0.0002	0.0114
	summer	0.0002	0.1600	0.0063	0.0567	0.0015	0.1041
Starry flounder	winter			0.0000	NA	0.0000	NA
	summer	0.0034	0.0277	0.0000	NA	0.0007	0.4713
Unspecified grenadiers	winter			0.0003	0.0332	0.0160	0.0434
	summer	0.0000	NA	0.0003	0.0092	0.0246	0.0464
Unspecified skate	winter			0.0764	0.1045	0.0326	0.0371
	summer	0.1814	0.3455	0.0648	0.0679	0.0310	0.0343
Yellowmouth rockfish	winter			0.0000	NA	0.0000	NA
	summer	0.0000	NA	0.0000	0.0087	0.0000	NA
Yellowtail rockfish	winter			0.0001	0.0317	0.0000	0.0012
	summer	0.0066	0.1077	0.0003	0.0138	0.0001	0.0044
Non-groundfish species		***Denominator = Retained groundfish (mt)***					
Dungeness crab	winter			0.0005	0.0279	0.0000	0.0024
	summer	0.1206	0.2020	0.0001	0.0095	0.0000	0.0041
Other non-FMP flatfish	winter			0.0008	0.0108	0.0016	0.0073
	summer	0.0040	0.0321	0.0003	0.0017	0.0031	0.0089
Other nongroundfish	winter			0.0103	0.0169	0.0093	0.0049
	summer	0.0061	0.0343	0.0113	0.0073	0.0188	0.0083
Tanner crab	winter			0.0018	0.0141	0.0361	0.0621
	summer	0.0000	NA	0.0024	0.0110	0.0376	0.0555

Table 6b. Bycatch ratios and standard errors from observed trips south of 40° 10' N latitude in the 2008 limited entry groundfish bottom trawl fishery by season and depth. Ratios are computed as the observed total catch weight divided by the observed weight (adjusted to fish tickets) of retained FMP groundfish species (excluding Pacific hake). Winter season is January-April and November-December and summer season is May-October. Species are grouped according to Appendix C.

SOUTH OF 40°10' N Lat.		**Depth interval (fathoms)**					
		0-125		**126-250**		**≥ 250**	
		Discard ratio	SE	Discard ratio	SE	Discard ratio	SE
Rebuilding species	**Season**	***Denominator = Retained groundfish (mt)***					
Bocaccio	winter	0.0008	NA	0.0001	NA	0.0000	NA
	summer	0.0142	0.2449	0.0012	0.0546	0.0002	0.0164
Canary rockfish	winter	0.0002	NA	0.0000	NA	0.0000	NA
	summer	0.0027	0.0617	0.0000	NA	0.0003	0.0261
Cowcod	winter	0.0000	NA	0.0000	NA	0.0000	NA
	summer	0.0005	0.3228	0.0000	NA	0.0000	NA
Darkblotched rockfish	winter	0.0001	0.0065	0.0096	0.1878	0.0002	0.0123
	summer	0.0003	0.0075	0.0081	0.0948	0.0059	0.1147
Widow rockfish	winter	0.0001	NA	0.0000	NA	0.0000	NA
	summer	0.0007	0.1340	0.0010	0.3430	0.0000	NA
Yelloweye rockfish	winter	0.0000	NA	0.0000	NA	0.0000	NA
	summer	0.0000	NA	0.0000	NA	0.0000	NA
Non-rebuilding species		***Denominator = Retained groundfish (mt)***					
Arrowtooth flounder	winter	0.0009	0.0093	0.0099	0.1176	0.0022	0.3919
	summer	0.0021	0.0544	0.0060	0.1245	0.0004	0.0320
Bank rockfish	winter	0.0000	NA	0.0000	NA	0.0000	0.0006
	summer	0.0000	NA	0.1712	8.3549	0.0000	NA
Big skate	winter	0.0186	0.4123	0.0001	NA	0.0000	NA
	summer	0.0021	0.3084	0.0000	NA	0.0000	NA
Black rockfish	winter	0.0000	NA	0.0000	NA	0.0000	NA
	summer	0.0000	NA	0.0000	NA	0.0002	NA
Blackgill rockfish	winter	0.0000	NA	0.0022	0.0239	0.0000	NA
	summer	0.0002	0.0083	0.0007	0.0229	0.0029	0.0915
Chilipepper	winter	0.0166	0.1068	0.0049	0.1013	0.0019	0.1880
	summer	0.1995	0.7375	0.0090	0.1057	0.0024	0.0751
Dover sole	winter	0.0053	0.0569	0.5619	3.4935	0.3810	1.2466
	summer	0.0761	0.5313	0.4463	1.6271	0.5570	1.0455
English sole	winter	0.1214	0.8106	0.0093	0.0971	0.0002	0.0409
	summer	0.1454	0.2015	0.0037	0.1376	0.0000	NA
Kelp greenling	winter	0.0000	NA	0.0000	NA	0.0000	NA
	summer	0.0000	NA	0.0000	NA	0.0000	NA
Lingcod	winter	0.0406	0.4437	0.0080	0.2354	0.0001	0.0078
	summer	0.0488	0.3385	0.0035	0.0856	0.0000	NA
Longnose skate	winter	0.2729	2.1585	0.1269	0.6342	0.0075	0.1109
	summer	0.1284	0.3479	0.1020	0.4385	0.0335	0.1667
Longspine thornyhead	winter	0.0000	NA	0.0011	0.0267	0.4086	0.7107
	summer	0.0002	0.1615	0.0089	0.3479	0.2360	0.4637
Mixed thornyheads	winter	0.0000	NA	0.0000	NA	0.0002	NA
	summer	0.0000	NA	0.0000	NA	0.0000	NA
Other flatfish	winter	0.0137	0.0432	0.0194	0.0892	0.0022	0.1437
	summer	0.3328	0.3942	0.0202	0.0967	0.0170	0.1242
Other groundfish	winter	0.0143	0.2336	0.0254	0.2981	0.0027	0.3694
	summer	0.0550	0.3478	0.0478	0.6152	0.0008	0.0199
Other nearshore rockfish	winter	0.0000	NA	0.0000	NA	0.0000	NA
	summer	0.0001	0.0177	0.0000	NA	0.0000	NA
Other shelf rockfish	winter	0.0042	0.0268	0.0004	0.0127	0.0000	NA
	summer	0.0576	0.8818	0.0104	0.0764	0.0001	0.0033

Table 6b continued.

SOUTH OF 40°10' N Lat.		Depth interval (fathoms) 0-125		126-250		≥ 250	
		Discard ratio	SE	Discard ratio	SE	Discard ratio	SE
Non-rebuilding species (cont.)	**Season**	***Denominator = Retained groundfish (mt)***					
Other slope rockfish	winter	0.0000	NA	0.0361	0.1420	0.0007	0.0113
	summer	0.0139	0.7959	0.0501	0.2446	0.0139	0.0724
Pacific hake	winter	0.0005	0.0107	0.0750	0.6185	0.0040	0.2932
	summer	0.0389	0.2573	0.1070	1.2592	0.0253	0.1658
Petrale sole	winter	0.8250	4.5466	0.2989	1.2992	0.0002	0.0207
	summer	0.4854	0.7824	0.1527	1.5434	0.0002	NA
Sablefish	winter	0.0010	0.0461	0.0809	0.4613	0.2381	0.5474
	summer	0.0099	0.3504	0.1345	0.7409	0.1839	0.4458
Sharpchin rockfish	winter	0.0000	NA	0.0000	NA	0.0000	NA
	summer	0.0000	NA	0.0000	NA	0.0000	NA
Shortbelly rockfish	winter	0.0000	NA	0.0002	NA	0.0000	NA
	summer	0.0003	0.0337	0.0149	0.2654	0.0000	NA
Shortspine thornyhead	winter	0.0000	NA	0.0289	0.2070	0.0991	0.2537
	summer	0.0014	0.1479	0.0090	0.0523	0.0573	0.1276
Spiny dogfish	winter	0.0062	0.0601	0.0147	0.1950	0.0002	0.0660
	summer	0.2716	1.1594	0.0522	0.4943	0.0002	0.0168
Splitnose rockfish	winter	0.0000	NA	0.0644	0.4694	0.0049	0.0878
	summer	0.0010	0.0247	0.2776	1.1062	0.0139	0.0739
Starry flounder	winter	0.0000	NA	0.0001	0.0068	0.0000	NA
	summer	0.0001	0.0128	0.0000	NA	0.0000	0.0026
Unspecified grenadiers	winter	0.0000	NA	0.0001	0.0195	0.0906	0.1910
	summer	0.0000	NA	0.0001	0.0059	0.0357	0.1344
Unspecified skate	winter	0.0005	0.0088	0.0170	0.1003	0.0202	0.0948
	summer	0.0836	0.1697	0.0692	0.2795	0.0156	0.1045
Yellowtail rockfish	winter	0.0000	NA	0.0000	NA	0.0000	NA
	summer	0.0001	0.0226	0.0000	NA	0.0000	NA
Non-rebuilding species	**Season**	***Denominator = Retained groundfish (mt)***					
Dungeness crab	winter	0.0236	0.2089	0.0087	0.4473	0.0000	NA
	summer	0.0493	0.1771	0.0002	0.0150	0.0000	NA
Other non-FMP flatfish	winter	0.0114	0.1428	0.0001	0.0050	0.0146	0.0632
	summer	0.0011	0.0076	0.0010	0.0204	0.0041	0.0318
Other nongroundfish	winter	0.0044	0.0196	0.0776	0.4273	0.0458	0.0285
	summer	0.0121	0.0107	0.0240	0.1228	0.0313	0.0264
Tanner crab	winter	0.0000	NA	0.0101	0.1032	0.0721	0.2031
	summer	0.0001	0.0325	0.0158	0.2192	0.0994	0.2876

Table 7. Summary of the number of length measurements and the number of individual fish sexed by WCGOP observers in the limited entry groundfish bottom trawl fishery from September 2003 through April 2009. The date range of biological data for each species is also provided. Biological data is only summarized for species with more than 30 observations.

	Years available	# lengths	# sexes
Rebuilding species			
Bocaccio	2004 - Apr 2009	1585	812
Canary rockfish	2004 - Apr 2009	2485	1557
Cowcod	2004 - Apr 2009	277	138
Darkblotched rockfish	Sep 2003 - Apr 2009	5521	2221
Pacific ocean perch	2004 - Apr 2009	3278	680
Widow rockfish	2004 - Apr 2009	451	127
Yelloweye rockfish	Sep 2003 - Apr 2009	134	90
Other species			
Arrowtooth flounder	2006 - Apr 2009	5705	1
Aurora rockfish	2004 - Apr 2009	5812	3
Bank rockfish	2006 - Apr 2009	32	0
Blackgill rockfish	2004 - Apr 2009	596	5
Chilipepper rockfish	2004, 2006 - Apr 2009	1155	6
Dover sole	2006 - Apr 2009	6222	0
Dungeness crab	2007 - Apr 2009	1865	1680
English sole	2006 - Apr 2009	3225	0
Greenstriped rockfish	2005 - Apr 2009	1084	6
Lingcod	2004 - Apr 2009	7277	503
Longnose skate	2006 - Apr 2009	7008	6787
Longspine thornyhead	2006 - Apr 2009	5731	0
Pacific halibut	Sep 2003 - Apr 2009	3833	0
Pacific sanddab	2006 - Apr 2009	2713	0
Petrale sole	2006 - Apr 2009	2621	1795
Redbanded rockfish	2006 - Apr 2009	1969	0
Rosethorn rockfish	2007 - Apr 2009	67	0
Rougheye rockfish	2004 - Apr 2009	2108	79
Sablefish	2004 - Apr 2009	3782	170
Sharpchin rockfish	2007 - Apr 2009	47	0
Shortraker	2004 - Apr 2009	745	28
Shortspine thornyhead	2006 - Apr 2009	5403	5
Silvergray rockfish	2004 - Apr 2009	95	25
Spiny dogfish	2006 - Apr 2009	5742	5667
Splitnose rockfish	2004, 2006 - Apr 2009	3322	2
Starry flounder	2006 - 2008	192	0
Stripetail rockfish	2006 - Apr 2009	883	0
Unidentified skate	2007 - 2008	106	106
Yellowtail rockfish	2004, 2006 - Apr 2009	164	0

Table 8. Summary of biological data for protected resources collected by WCGOP observers in the limited entry groundfish bottom trawl fishery from September 2003 through April 2009. The number of length measurements and the number of individuals sexed is reported for each year where data are available.

	# lengths	# sexes
Salmon		
Chinook salmon		
Sep - Dec 2003	8	8
2004	276	265
2005	118	105
2006	9	9
2007	28	28
2008	54	53
Jan - Apr 2009	61	59
Chum salmon		
2003	1	0
2004	1	1
Coho salmon		
2004	5	5
2005	1	1
2007	2	1
Unidentified salmon		
2004	3	3

APPENDIX A

WCGOP Database Table Hierarchy

TRIPS

FISHING_ACTIVITIES

FISHING_LOCATIONS

CATCHES

SPECIES COMPOSITION

SPECIES_COMPOSITION_ITEMS

BIO_SPECIMENS

BIO_SPECIMEN_ITEMS

DISSECTIONS

Database Table Descriptions

The database tables listed below are a subset of the tables contained in the entire Oracle database. They represent the tables that are actually used to contain the WCGOP data collected by the WCGOP.

BIO_SPECIMENS	Sets of species physical measurements resulting from sampling catches occurring in a tow or set
BIO_SPECIMEN_ITEMS	Physical measurements collected for an individual fish, mammal or bird occurring in a biological sample
CATCHES	PacFIN catch category based on estimates of fish caught during a tow or set
CATCH_CATEGORIES	PacFIN catch categories
DISSECTIONS	Physical specimens collected for an individual fish, mammal or bird
FISHING_ACTIVITIES	Fishing tows or sets occurring during a trip
FISHING_LOCATIONS	Locations of tows or sets
PORTS	Coastal cities where fishing activity is based out of
SPECIES	Fish, mammal, and bird species that might be encountered during fishing
SPECIES_COMPOSITIONS	Sets of species weights and counts resulting from sampling catches occurring in a tow or set
SPECIES_COMPOSITIONS_ITEMS	Weights and counts for individual species occurring in a species composition sample
TRIPS	Sets of fishing activities that occur between the time a vessel leaves port and when it returns
VESSELS	Trawl, longline, pot, or other fishing vessels

APPENDIX B

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 zyopterus*
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. chrysolmelas.*
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. aleutianus*
Sharpchin, *S. zacentrus*
Shortbelly, *S. jordani*
Shortraker, *S. borealis*
Shortspine thornyhead, *Sebastolobus alascanus*
Silvergrey, *Sebastes. brevispinus*
Speckled, *S. ovalis*
Splitnose rockfish, *S. diploproa*
Squarespot, *S. hopkinsi*
Starry, *S. constellatus*
Stripetail, *S. saxicola*
Swordspine, *S. ensifer*
Tiger, *S. nigorcinctus*
Treefish, *S. serriceps*
Vermilion, *S. miniatus*
Widow, *S. entomelas*
Yelloweye, *S. ruberrimus*
Yellowmouth, *S. reedi*
Yellowtail, *S. flavidus*

APPENDIX C

Species indentification codes used in the Pacific Coast Fisheries Information Network (PacFIN) database and assigned to WCGOP observer data, with aggregated species groups used in this report (Tables 4-6).

PacFIN Species ID	PacFIN Common Name	Species Group - North of 40˚ 10' N latitude	Species Group - South of 40˚ 10' N latitude	FMP
ALBC	ALBACORE	Other nongroundfish	Other nongroundfish	
APLC	ALASKA PLAICE	Other non-FMP flatfish	Other non-FMP flatfish	
ARR1	NOM. AURORA ROCKFISH	Other slope rockfish	Other slope rockfish	yes
ARRA	AURORA ROCKFISH	Other slope rockfish	Other slope rockfish	yes
ART1	NOM. ARROWTOOTH FLOUNDER	Arrowtooth flounder	Arrowtooth flounder	yes
ARTH	ARROWTOOTH FLOUNDER	Arrowtooth flounder	Arrowtooth flounder	yes
ASRK	PACIFIC ANGEL SHARK	Other nongroundfish	Other nongroundfish	
BABL	BLACK ABALONE	Other nongroundfish	Other nongroundfish	
BANK	BANK ROCKFISH	Other slope rockfish	Bank rockfish (Remaining rockfish)	yes
BCAC	BOCACCIO	Bocaccio (Remaining rockfish)	Bocaccio	yes
BCC1	NOM. BOCACCIO	Bocaccio (Remaining rockfish)	Bocaccio	yes
BCLM	BUTTER CLAM	Other nongroundfish	Other nongroundfish	
BGL1	NOM. BLACKGILL ROCKFISH	Other slope rockfish	Blackgill (Remaining rockfish)	yes
BKCR	BLUE KING CRAB	Other nongroundfish	Other nongroundfish	
BLCK	BLACK ROCKFISH	Black rockfish	Black rockfish	yes
BLGL	BLACKGILL ROCKFISH	Other slope rockfish	Blackgill (Remaining rockfish)	yes
BLK1	NOM. BLACK ROCKFISH	Black rockfish	Black rockfish	yes
BLU1	NOM. BLUE ROCKFISH	Other nearshore rockfish	Other nearshore rockfish	yes
BLUR	BLUE ROCKFISH	Other nearshore rockfish	Other nearshore rockfish	yes
BMCK	BULLET MACKEREL	Other nongroundfish	Other nongroundfish	
BMRL	BLUE MARLIN	Other nongroundfish	Other nongroundfish	
BMSL	BLUE OR BAY MUSSEL	Other nongroundfish	Other nongroundfish	
BNK1	NOM. BANK ROCKFISH	Other slope rockfish	Bank rockfish (Remaining rockfish)	yes
BRNZ	BRONZESPOTTED ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
BRW1	NOM. BROWN ROCKFISH	Other nearshore rockfish	Other nearshore rockfish	yes
BRWN	BROWN ROCKFISH	Other nearshore rockfish	Other nearshore rockfish	yes
BRZ1	NOM. BRONZESPOTTED RK	Other shelf rockfish	Other shelf rockfish	yes
BSJK	BLACK SKIPJACK	Other nongroundfish	Other nongroundfish	
BSKT	BIG SKATE	Big skate	Big skate	yes
BSOL	BUTTER SOLE	Other flatfish	Other flatfish	yes
BSRK	BLUE SHARK	Other nongroundfish	Other nongroundfish	
BSRM	UNSP. BAIT SHRIMP	Other nongroundfish	Other nongroundfish	
BTCR	BAIRDI TANNER CRAB	Tanner crab	Tanner crab	
BTNA	BLUEFIN TUNA	Other nongroundfish	Other nongroundfish	
BTRY	BAT RAY	Other nongroundfish	Other nongroundfish	
BYEL	BLACK-AND-YELLOW ROCKFISH	Other nearshore rockfish	Other nearshore rockfish	yes
BYL1	NOM. BLACK-AND-YELLOW RK	Other nearshore rockfish	Other nearshore rockfish	yes
CBZ1	NOM. CABEZON	Other groundfish	Cabezon	yes
CBZN	CABEZON	Other groundfish	Cabezon	yes
CEEL	SPOTTED CUSK-EEL	Other nongroundfish	Other nongroundfish	

PacFIN Species ID	PacFIN Common Name	Species Group - North of 40˚ 10' N latitude	Species Group - South of 40˚ 10' N latitude	FMP
CHL1	NOM. CALIFORNIA HALIBUT	California halibut	California halibut	
CHLB	CALIFORNIA HALIBUT	California halibut	California halibut	
CHN1	NOM. CHINA ROCKFISH	Other nearshore rockfish	Other nearshore rockfish	yes
CHNA	CHINA ROCKFISH	Other nearshore rockfish	Other nearshore rockfish	yes
CHNK	CHINOOK SALMON	Other nongroundfish	Other nongroundfish	
CHUM	CHUM SALMON	Other nongroundfish	Other nongroundfish	
CKLE	BASKET COCKLE	Other nongroundfish	Other nongroundfish	
CLC1	NOM. CALICO ROCKFISH	Other nearshore rockfish	Other nearshore rockfish	yes
CLCO	CALICO ROCKFISH	Other nearshore rockfish	Other nearshore rockfish	yes
CLP1	NOM. CHILIPEPPER	Chilipepper (Remaining rockfish)	Chilipepper	yes
CLPR	CHILIPEPPER	Chilipepper (Remaining rockfish)	Chilipepper	yes
CMCK	CHUB MACKEREL	Other nongroundfish	Other nongroundfish	
CMEL	CHAMELEON ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
CML1	NOM. CHAMELEON ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
CMSL	CALIFORNIA MUSSEL	Other nongroundfish	Other nongroundfish	
CNR1	NOM. CANARY ROCKFISH	Canary rockfish	Canary rockfish	yes
CNRY	CANARY ROCKFISH	Canary rockfish	Canary rockfish	yes
COHO	COHO SALMON	Other nongroundfish	Other nongroundfish	
COP1	NOM. COPPER ROCKFISH	Other nearshore rockfish	Other nearshore rockfish	yes
COPP	COPPER ROCKFISH	Other nearshore rockfish	Other nearshore rockfish	yes
CPLN	CAPELIN	Other nongroundfish	Other nongroundfish	
CSKT	CALIFORNIA SKATE	Unspecified skate	Unspecified skate	yes
CSOL	CURLFIN SOLE	Other flatfish	Other flatfish	yes
CTRB	C-O SOLE	Other non-FMP flatfish	Other non-FMP flatfish	
CUDA	PACIFIC BARRACUDA	Other nongroundfish	Other nongroundfish	
CWC1	NOM. COWCOD ROCKFISH	Other shelf rockfish	Cowcod	yes
CWCD	COWCOD ROCKFISH	Other shelf rockfish	Cowcod	yes
DBR1	NOM. DARKBLOTCHED ROCKFISH	Darkblotched rockfish	Darkblotched rockfish	yes
DBRK	DARKBLOTCHED ROCKFISH	Darkblotched rockfish	Darkblotched rockfish	yes
DCRB	DUNGENESS CRAB	Dungeness crab	Dungeness crab	
DFLT	UNSP. DEEP FLOUNDERS	Other flatfish	Other flatfish	yes
DOVR	DOVER SOLE	Dover sole	Dover sole	yes
DRDO	DORADO	Other nongroundfish	Other nongroundfish	
DSOL	DEEPSEA SOLE	Other non-FMP flatfish	Other non-FMP flatfish	
DSRK	SPINY DOGFISH	Spiny dogfish	Spiny dogfish	yes
DTRB	DIAMOND TURBOT	Other non-FMP flatfish	Other non-FMP flatfish	
DUSK	DUSKY ROCKFISH	Other groundfish	Other groundfish	yes
DVR1	NOM. DOVER SOLE	Dover sole	Dover sole	yes
DWRF	DWARF-RED ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
EELS	UNSPECIFIED EELS	Other nongroundfish	Other nongroundfish	
EGL1	NOM. ENGLISH SOLE	English sole	English sole	yes
EGLS	ENGLISH SOLE	English sole	English sole	yes
ESTR	EASTERN OYSTER	Other nongroundfish	Other nongroundfish	
ETNA	BIGEYE TUNA	Other nongroundfish	Other nongroundfish	
EULC	EULACHON	Eulachon	Eulachon	

PacFIN Species ID	PacFIN Common Name	Species Group - North of 40˚ 10' N latitude	Species Group - South of 40˚ 10' N latitude	FMP
EURO	EUROPEAN OYSTER	Other nongroundfish	Other nongroundfish	
FLAG	FLAG ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
FLG1	NOM. FLAG ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
FNTS	FANTAIL SOLE	Other non-FMP flatfish	Other non-FMP flatfish	
FRCK	FRECKLED ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
FSOL	FLATHEAD SOLE	Other flatfish	Other flatfish	yes
GABL	GREEN ABALONE	Other nongroundfish	Other nongroundfish	
GBAS	GIANT SEA BASS	Other nongroundfish	Other nongroundfish	
GBL1	NOM. GREENBLOTCHED RK	Other shelf rockfish	Other shelf rockfish	yes
GBLC	GREENBLOTCHED ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
GCLM	GAPER CLAM	Other nongroundfish	Other nongroundfish	
GDUK	GEODUCK	Other nongroundfish	Other nongroundfish	
GKCR	GOLDEN KING CRAB	Other nongroundfish	Other nongroundfish	
GPH1	NOM. GOPHER ROCKFISH	Other nearshore rockfish	Gopher rockfish (Remaining rockfish)	yes
GPHR	GOPHER ROCKFISH	Other nearshore rockfish	Gopher rockfish (Remaining rockfish)	yes
GPRW	GOLDEN PRAWN	Other nongroundfish	Other nongroundfish	
GRAS	GRASS ROCKFISH	Other nearshore rockfish	Other nearshore rockfish	yes
GRDR	UNSP. GRENADIERS	Unspecified grenadiers	Unspecified grenadiers	yes
GRS1	NOM. GRASS ROCKFISH	Other nearshore rockfish	Other nearshore rockfish	yes
GSP1	NOM. GREENSPOTTED RK	Other shelf rockfish	Other shelf rockfish	yes
GSPT	GREENSPOTTED ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
GSQD	GIANT SQUID	Other nongroundfish	Other nongroundfish	
GSR1	NOM. GREENSTRIPED ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
GSRK	GREENSTRIPED ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
GSRM	GHOST SHRIMP	Other nongroundfish	Other nongroundfish	
GSTG	GREEN STURGEON	Green sturgeon	Green sturgeon	
GTRB	GREENLAND TURBOT	Other non-FMP flatfish	Other non-FMP flatfish	
HBRK	HALFBANDED ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
HCLM	HORSE CLAMS	Other nongroundfish	Other nongroundfish	
HLQN	HARLEQUIN ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
HNY1	NOM. HONEYCOMB ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
HNYC	HONEYCOMB ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
HTRB	HORNYHEAD TURBOT	Other non-FMP flatfish	Other non-FMP flatfish	
ISRK	BIGEYE THRESHER SHARK	Other nongroundfish	Other nongroundfish	
JCLM	CALIFORNIA JACKKNIFE CLAM	Other nongroundfish	Other nongroundfish	
JMCK	JACK MACKEREL	Other nongroundfish	Other nongroundfish	
KFSH	GIANT KELPFISH	Other nongroundfish	Other nongroundfish	
KGL1	NOM. KELP GREENLING	Kelp greenling	Kelp greenling	yes
KLP1	NOM. KELP ROCKFISH	Other nearshore rockfish	Other nearshore rockfish	yes
KLPG	KELP GREENLING	Kelp greenling	Kelp greenling	yes
KLPR	KELP ROCKFISH	Other nearshore rockfish	Other nearshore rockfish	yes
KMKA	KAMCHATKA FLOUNDER	Other non-FMP flatfish	Other non-FMP flatfish	
KSTR	KUMAMOTO OYSTER	Other nongroundfish	Other nongroundfish	
LCD1	NOM. LINGCOD	Lingcod	Lingcod	yes
LCLM	NATIVE LITTLENECK	Other nongroundfish	Other nongroundfish	

PacFIN Species ID	PacFIN Common Name	Species Group - North of 40˚ 10' N latitude	Species Group - South of 40˚ 10' N latitude	FMP
LCOD	LINGCOD	Lingcod	Lingcod	yes
LDAB	LONGFIN SANDDAB	Other non-FMP flatfish	Other non-FMP flatfish	
LDB1	NOM. LONGFIN SANDDAB	Other non-FMP flatfish	Other non-FMP flatfish	
LOBS	CALIF. SPINY LOBSTER	Other nongroundfish	Other nongroundfish	
LSKT	LONGNOSE SKATE	Longnose skate	Longnose skate	yes
LSP1	NOM. LONGSPINE THORNYHEAD	Longspine thornyhead	Longspine thornyhead	yes
LSPN	LONGSPINE THORNYHEAD	Longspine thornyhead	Longspine thornyhead	yes
LSRK	LEOPARD SHARK	Other groundfish	Other groundfish	yes
LSTR	OLYMPIA OYSTER	Other nongroundfish	Other nongroundfish	
LUVR	LOUVAR	Other nongroundfish	Other nongroundfish	
MACL	MUD CLAMS	Other nongroundfish	Other nongroundfish	
MAKO	SHORTFIN MAKO SHARK	Other nongroundfish	Other nongroundfish	
MCLM	MANILA CLAM	Other nongroundfish	Other nongroundfish	
MEEL	MONKEYFACE EEL	Other nongroundfish	Other nongroundfish	
MISC	MISC. FISH/ANIMALS	Other nongroundfish	Other nongroundfish	
MOLA	COMMON MOLA	Other nongroundfish	Other nongroundfish	
MRLN	STRIPED MARLIN	Other nongroundfish	Other nongroundfish	
MSC2	MISCELLANEOUS FISH	Other nongroundfish	Other nongroundfish	
MSHP	PLAINFIN MIDSHIPMAN	Other nongroundfish	Other nongroundfish	
MSQD	MARKET SQUID	Other nongroundfish	Other nongroundfish	
MSRM	MUD SHRIMP	Other nongroundfish	Other nongroundfish	
MXR1	NOM. MEXICAN ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
MXRF	MEXICAN ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
NANC	NORTHERN ANCHOVY	Other nongroundfish	Other nongroundfish	
NRCK	NORTHERN ROCKFISH	Other groundfish	Other groundfish	yes
NSHR	NORTHERN NEAR-SHORE RK	Other nearshore rockfish	Other nearshore rockfish	yes
NSLF	NORTHERN SHELF ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
NSLP	NORTHERN SLOPE ROCKFISH	Other slope rockfish	Other slope rockfish	yes
NUSF	NOR. UNSP. SHELF ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
NUSP	NOR. UNSP. SLOPE ROCKFISH	Other slope rockfish	Other slope rockfish	yes
NUSR	NOR. UNSP. NEAR-SHORE RK	Other nearshore rockfish	Other nearshore rockfish	yes
OABL	OTHER ABALONE	Other nongroundfish	Other nongroundfish	
OANC	OTHER ANCHOVY	Other nongroundfish	Other nongroundfish	
OBAS	OTHER BASS	Other nongroundfish	Other nongroundfish	
OCLM	OTHER CLAM	Other nongroundfish	Other nongroundfish	
OCRB	OTHER CRAB	Other nongroundfish	Other nongroundfish	
OCRK	OTHER CROAKER	Other nongroundfish	Other nongroundfish	
OCTP	UNSP. OCTOPUS	Other nongroundfish	Other nongroundfish	
ODSR	OTHER DEMERSAL RKFSH	Other groundfish	Other groundfish	yes
OECH	OTHER ECHINODERM	Other nongroundfish	Other nongroundfish	
OFLT	OTHER FLATFISH	Other flatfish	Other flatfish	yes
OGRN	OTHER GROUNDFISH	Other groundfish	Other groundfish	yes
OLV1	NOM. OLIVE ROCKFISH	Other nearshore rockfish	Other nearshore rockfish	yes
OLVE	OLIVE ROCKFISH	Other nearshore rockfish	Other nearshore rockfish	yes
OMSK	OTHER MOLLUSKS	Other nongroundfish	Other nongroundfish	
OPLG	OTHER PELAGIC RKFSH	Other groundfish	Other groundfish	yes

PacFIN Species ID	PacFIN Common Name	Species Group - North of 40˚ 10' N latitude	Species Group - South of 40˚ 10' N latitude	FMP
ORCK	OTHER ROCKFISH	Other slope rockfish (>150 fm)	Other slope rockfish (>150 fm)	yes
ORCK	OTHER ROCKFISH	Other shelf rockfish (<150 fm)	Other shelf rockfish (<150 fm)	yes
ORND	OTHER ROUNDFISH	Other groundfish	Other groundfish	yes
OSCL	OTHER SCALLOP	Other nongroundfish	Other nongroundfish	
OSKT	OTHER SKATES	Unspecified skate	Unspecified skate	yes
OSLR	OTHER SLOPE RKFSH	Other slope rockfish	Other slope rockfish	yes
OSRK	OTHER SHARK	Other nongroundfish	Other nongroundfish	
OSRM	OTHER SHRIMP	Other nongroundfish	Other nongroundfish	
OSTR	OTHER OYSTER	Other nongroundfish	Other nongroundfish	
OTCR	OPILIO TANNER CRAB	Tanner crab	Tanner crab	
OTNA	OTHER TUNA	Other nongroundfish	Other nongroundfish	
OURC	OTHER SEA URCHINS	Other nongroundfish	Other nongroundfish	
OWFS	OCEAN WHITEFISH	Other nongroundfish	Other nongroundfish	
PABL	PINK ABALONE	Other nongroundfish	Other nongroundfish	
PBNT	PACIFIC BONITO	Other nongroundfish	Other nongroundfish	
PBTR	PACIFIC BUTTERFISH	Other nongroundfish	Other nongroundfish	
PCLM	PISMO CLAM	Other nongroundfish	Other nongroundfish	
PCOD	PACIFIC COD	Pacific cod	Other groundfish	yes
PDAB	PACIFIC SANDDAB	Other flatfish	Other flatfish	yes
PDB1	NOM. PACIFIC SANDDAB	Other flatfish	Other flatfish	yes
PGMY	PYGMY ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
PHLB	PACIFIC HALIBUT	Pacific halibut	Pacific halibut	
PHRG	PACIFIC HERRING	Other nongroundfish	Other nongroundfish	
PINK	PINK SALMON	Other nongroundfish	Other nongroundfish	
PLCK	WALLEYE POLLOCK	Other groundfish	Other groundfish	yes
PNK1	NOM. PINK ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
PNKR	PINK ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
POMF	PACIFIC POMFRET	Other nongroundfish	Other nongroundfish	
POP	PACIFIC OCEAN PERCH	Pacific ocean perch	Other slope rockfish	yes
POP1	GEN. SHELF/SLOPE RF	Other slope rockfish	Other slope rockfish	yes
POP2	NOMINAL POP	Pacific ocean perch	Other slope rockfish	yes
PRCL	PURPLE CLAM	Other nongroundfish	Other nongroundfish	
PROW	PROWFISH	Other nongroundfish	Other nongroundfish	
PRR1	NOM. PINKROSE ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
PRRK	PINKROSE ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
PSDN	PACIFIC SARDINE	Other nongroundfish	Other nongroundfish	
PSHP	PINK SHRIMP	Other nongroundfish	Other nongroundfish	
PSRK	PELAGIC THRESHER SHARK	Other nongroundfish	Other nongroundfish	
PSTR	PACIFIC OYSTER	Other nongroundfish	Other nongroundfish	
PTR1	NOM. PETRALE SOLE	Petrale sole	Petrale sole	yes
PTRL	PETRALE SOLE	Petrale sole	Petrale sole	yes
PUGT	PUGET SOUND ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
PWHT	PACIFIC WHITING	Pacific hake	Pacific hake	yes
QCLM	NORTHERN QUAHOG CLAM	Other nongroundfish	Other nongroundfish	
QFSH	QUEENFISH	Other nongroundfish	Other nongroundfish	
QLB1	NOM. QUILLBACK ROCKFISH	Other nearshore rockfish	Other nearshore rockfish	yes

PacFIN Species ID	PacFIN Common Name	Species Group - North of 40˚ 10' N latitude	Species Group - South of 40˚ 10' N latitude	FMP
QLBK	QUILLBACK ROCKFISH	Other nearshore rockfish	Other nearshore rockfish	yes
RABL	RED ABALONE	Other nongroundfish	Other nongroundfish	
RATF	SPOTTED RATFISH	Other groundfish	Other groundfish	yes
RCK1	BOCACCIO+CHILIPEPPER RK	Other shelf rockfish	Other shelf rockfish	yes
RCK2	UNSP. BOLINA RCKFSH	Other nearshore rockfish	Other nearshore rockfish	yes
RCK3	UNSP. DPWTR REDS RCKFSH	Other slope rockfish	Other slope rockfish	yes
RCK4	UNSP. REDS RCKFSH	Other groundfish	Other groundfish	yes
RCK5	UNSP. SMALL REDS RCKFSH	Other groundfish	Other groundfish	yes
RCK6	UNSP. ROSEFISH RCKFSH	Other groundfish	Other groundfish	yes
RCK7	UNSP. GOPHER RCKFSH	Other nearshore rockfish	Gopher rockfish (Remaining rockfish)	yes
RCK8	CANARY+VERMILION RCKFSH	Canary rockfish	Canary rockfish	yes
RCK9	BLACK+BLUE ROCKFISH	Black rockfish	Black rockfish	yes
RCKG	ROCK GREENLING	Other nongroundfish	Other nongroundfish	
RCLM	RAZOR CLAM	Other nongroundfish	Other nongroundfish	
RCRB	ROCK CRAB	Other nongroundfish	Other nongroundfish	
RDB1	NOM. REDBANDED ROCKFISH	Other slope rockfish	Other slope rockfish	yes
RDBD	REDBANDED ROCKFISH	Other slope rockfish	Other slope rockfish	yes
REDS	REDSTRIPE ROCKFISH	Redstripe rockfish (Remaining rockfish)	Other shelf rockfish	yes
REX	REX SOLE	Other flatfish	Other flatfish	yes
REX1	NOM. REX SOLE	Other flatfish	Other flatfish	yes
REYE	ROUGHEYE ROCKFISH	Other slope rockfish	Other slope rockfish	yes
RFLT	REMAINING FLATFISH	Other flatfish	Other flatfish	yes
RGL1	NOM. ROCK GREENLING	Other nongroundfish	Other nongroundfish	
RGRN	REMAINING GROUNDFISH	Other groundfish	Other groundfish	yes
RHRG	ROUND HERRING	Other nongroundfish	Other nongroundfish	
RKCR	RED KING CRAB	Other nongroundfish	Other nongroundfish	
ROS1	NOM. ROSY ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
ROSY	ROSY ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
RPRW	RIDGEBACK PRAWN	Other nongroundfish	Other nongroundfish	
RRCK	REMAINING ROCKFISH	Other groundfish	Other groundfish	yes
RRND	REMAINING ROUNDFISH	Other groundfish	Other groundfish	yes
RSL1	NOM. ROCK SOLE	Other flatfish	Other flatfish	yes
RSOL	ROCK SOLE	Other flatfish	Other flatfish	yes
RST1	NOM. ROSETHORN ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
RSTN	ROSETHORN ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
RURC	RED SEA URCHIN	Other nongroundfish	Other nongroundfish	
RZCL	ROSY RAZOR CLAM	Other nongroundfish	Other nongroundfish	
SABL	SABLEFISH	Sablefish	Sablefish	yes
SAIL	SAILFISH	Other nongroundfish	Other nongroundfish	
SARY	PACIFIC SAURY	Other nongroundfish	Other nongroundfish	
SBL1	NOM. SHORTBELLY ROCKFISH	Shortbelly rockfish	Shortbelly rockfish	yes
SBLY	SHORTBELLY ROCKFISH	Shortbelly rockfish	Shortbelly rockfish	yes
SCLM	SOFT-SHELLED CLAM	Other nongroundfish	Other nongroundfish	
SCLP	UNSP. SCULPIN	Other nongroundfish	Other nongroundfish	
SCOR	CALIFORNIA SCORPIONFISH	Other groundfish	Other nearshore rockfish	yes

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SCR1	NOM. CALIF. SCORPIONFISH	Other groundfish	Other nearshore rockfish	yes
SDB1	NOM. SPECKLED SANDDAB	Other non-FMP flatfish	Other non-FMP flatfish	
SFL1	NOM. STARRY FLOUNDER	Starry flounder	Starry flounder	yes
SFLT	UNSP. SHALLOW FLOUNDERS	Other flatfish	Other flatfish	yes
SHAD	UNSPECIFIED SHAD	Other nongroundfish	Other nongroundfish	
SHP1	NOM. CALIFORNIA SHEEPHEAD	Other nongroundfish	Other nongroundfish	
SHPD	CALIFORNIA SHEEPHEAD	Other nongroundfish	Other nongroundfish	
SHRP	SHARPCHIN ROCKFISH	Sharpchin rockfish (Remaining rockfish)	Sharpchin - south	yes
SKCR	SCARLET KING CRAB	Other nongroundfish	Other nongroundfish	
SLGR	SILVERGREY ROCKFISH	Silvergrey rockfish (Remaining rockfish)	Other shelf rockfish	yes
SLNS	SLENDER SOLE	Other non-FMP flatfish	Other non-FMP flatfish	
SMLT	UNSP. SMELT	Other nongroundfish	Other nongroundfish	
SNOS	SPLITNOSE ROCKFISH	Splitnose rockfish (Remaining rockfish)	Splitnose rockfish	yes
SNS1	NOM. SPLITNOSE ROCKFISH	Splitnose rockfish (Remaining rockfish)	Splitnose rockfish	yes
SOCK	SOCKEYE SALMON	Other nongroundfish	Other nongroundfish	
SPK1	NOM. SPECKLED ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
SPKL	SPECKLED ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
SPRW	SPOTTED PRAWN	Other nongroundfish	Other nongroundfish	
SQID	UNSP. SQUID	Other nongroundfish	Other nongroundfish	
SQR1	NOM. SQUARESPOT	Other shelf rockfish	Other shelf rockfish	yes
SQRS	SQUARESPOT ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
SRFP	SURFPERCH SPP.	Other nongroundfish	Other nongroundfish	
SRKR	SHORTRAKER ROCKFISH	Other slope rockfish	Other slope rockfish	yes
SSCL	SHARPNOSE SCULPIN	Other nongroundfish	Other nongroundfish	
SSDB	SPECKLED SANDDAB	Other non-FMP flatfish	Other non-FMP flatfish	
SSHR	SOUTHERN NEAR-SHORE RK	Other nearshore rockfish	Other nearshore rockfish	yes
SSLF	SOUTHERN SHELF ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
SSLP	SOUTHERN SLOPE ROCKFISH	Other slope rockfish	Other slope rockfish	yes
SSO1	NOM. SAND SOLE	Other flatfish	Other flatfish	yes
SSOL	SAND SOLE	Other flatfish	Other flatfish	yes
SSP1	NOM. SHORTSPINE THORNYHEAD	Shortspine thornyhead	Shortspine thornyhead	yes
SSPN	SHORTSPINE THORNYHEAD	Shortspine thornyhead	Shortspine thornyhead	yes
SSRD	Deep So. Nearshore RF	Other nearshore rockfish	Other nearshore rockfish	yes
SSRK	SOUPFIN SHARK	Other groundfish	Other groundfish	yes
SSRS	Shallow So. Nearshore RF	Other nearshore rockfish	Other nearshore rockfish	yes
STAR	STARRY ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
STL1	NOM. STRIPETAIL ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
STLH	STEELHEAD	Other nongroundfish	Other nongroundfish	
STNA	SKIPJACK TUNA	Other nongroundfish	Other nongroundfish	
STR1	NOM. STARRY ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
STRK	STRIPETAIL ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
STRY	STARRY FLOUNDER	Starry flounder	Starry flounder	yes
SUSF	SOU. UNSP. SHELF ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
SUSP	SOU. UNSP. SLOPE ROCKFISH	Other slope rockfish	Other slope rockfish	yes

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SUSR	SOU. UNSP. NEAR-SHORE RK	Other nearshore rockfish	Other nearshore rockfish	yes
SWRD	SWORDFISH	Other nongroundfish	Other nongroundfish	
SWS1	NOM. SWORDSPINE ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
SWSP	SWORDSPINE ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
TCOD	PACIFIC TOMCOD	Other nongroundfish	Other nongroundfish	
TGR1	NOM. TIGER ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
THD1	NOM. THORNYHEADS	Mixed thornyheads	Mixed thornyheads	yes
THDS	THORNYHEADS (MIXED)	Mixed thornyheads	Mixed thornyheads	yes
TIGR	TIGER ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
TRE1	NOM. TREEFISH	Other nearshore rockfish	Other nearshore rockfish	yes
TREE	TREEFISH	Other nearshore rockfish	Other nearshore rockfish	yes
TSRK	COMMON THRESHER SHARK	Other nongroundfish	Other nongroundfish	
UABL	UNSPECIFIED ABALONE	Other nongroundfish	Other nongroundfish	
UCLM	UNSPECIFIED CLAM	Other nongroundfish	Other nongroundfish	
UCRB	UNSPECIFIED CRAB	Other nongroundfish	Other nongroundfish	
UDAB	UNSP. SANDDABS	Other flatfish	Other flatfish	yes
UDF1	UNSP. DEEP-91 FLOUNDERS	Other flatfish	Other flatfish	yes
UDF2	UNSP. DEEP-95 FLOUNDERS	Other flatfish	Other flatfish	yes
UDM1	UNSP. DEMERSAL-91	Other groundfish	Other groundfish	yes
UDNR	UNSP. DEEP NEAR-SHORE RF	Other nearshore rockfish	Other nearshore rockfish	yes
UDSR	UNSP. DEMERSAL RKFSH	Other groundfish	Other groundfish	yes
UDW1	SHORTRAKER+ROUGHEYE	Other slope rockfish	Other slope rockfish	yes
UECH	UNSPECIFIED ECHINODERM	Other nongroundfish	Other nongroundfish	
UFL1	FLOUNDERS (NO FSOL)	Other flatfish	Other flatfish	yes
UFLT	UNSP. FLATFISH	Other flatfish	Other flatfish	yes
UGRN	UNSP. GROUNDFISH	Other groundfish	Other groundfish	yes
UHAG	UNSPECIFIED HAGFISH	Other nongroundfish	Other nongroundfish	
UHLB	UNSPECIFIED HALIBUT	Other nongroundfish	Other nongroundfish	
UJEL	UNSP. JELLYFISH	Other nongroundfish	Other nongroundfish	
UKCR	UNSP. KING CRAB	Other nongroundfish	Other nongroundfish	
UMCK	UNSP. MACKEREL	Other nongroundfish	Other nongroundfish	
UMSK	UNSPECIFIED MOLLUSKS	Other nongroundfish	Other nongroundfish	
UPLG	UNSP. PELAGIC RKFSH	Other groundfish	Other groundfish	yes
UPOP	UNSP. POP GROUP	Pacific ocean perch	Other slope rockfish	yes
URCK	UNSP. ROCKFISH	Other slope rockfish (>150 fm)	Other slope rockfish (>150 fm)	yes
URCK	UNSP. ROCKFISH	Other shelf rockfish (<150 fm)	Other shelf rockfish (<150 fm)	yes
URK1	SRKR+REYE+NRCK+SHRP	Other slope rockfish	Other slope rockfish	yes
URND	UNSP. ROUNDFISH	Other groundfish	Other groundfish	yes
USCL	UNSPECIFIED SCALLOP	Other nongroundfish	Other nongroundfish	
USCU	UNSP. SEA CUCUMBERS	Other nongroundfish	Other nongroundfish	
USF1	UNSP. SHALLOW-91 FLOUNDERS	Other flatfish	Other flatfish	yes
USHR	UNSP. NEAR-SHORE ROCKFISH	Other nearshore rockfish	Other nearshore rockfish	yes
USKT	UNSP. SKATE	Unspecified skate	Unspecified skate	yes
USLF	UNSP. SHELF ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
USLP	UNSP. SLOPE ROCKFISH	Other slope rockfish	Other slope rockfish	yes
USLR	UNSP. SLOPE RKFSH	Other slope rockfish	Other slope rockfish	yes

PacFIN Species ID	PacFIN Common Name	Species Group - North of 40˚ 10' N latitude	Species Group - South of 40˚ 10' N latitude	FMP
USMN	UNSP. SALMON	Other nongroundfish	Other nongroundfish	
USR1	UNSP. SLOPE-91	Other groundfish	Other groundfish	yes
USR2	UNSP. SLOPE-93	Other groundfish	Other groundfish	yes
USRK	UNSP. SHARK	Other nongroundfish	Other nongroundfish	
USRM	UNSP. OCEAN SHRIMP	Other nongroundfish	Other nongroundfish	
USTG	UNSP. STURGEON	Other nongroundfish	Other nongroundfish	
USTR	UNSPECIFIED OYSTER	Other nongroundfish	Other nongroundfish	
UTCR	UNSP. TANNER CRAB	Tanner crab	Tanner crab	
UTNA	UNSPECIFIED TUNA	Other nongroundfish	Other nongroundfish	
UTRB	UNSP. TURBOTS	Other flatfish	Other flatfish	yes
UURC	UNSP. SEA URCHINS	Other nongroundfish	Other nongroundfish	
VRM1	NOM. VERMILLION ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
VRML	VERMILION ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
WABL	WHITE ABALONE	Other nongroundfish	Other nongroundfish	
WBAS	WHITE SEABASS	Other nongroundfish	Other nongroundfish	
WCLM	WASHINGTON CLAM	Other nongroundfish	Other nongroundfish	
WCRK	WHITE CROAKER	Other nongroundfish	Other nongroundfish	
WDOW	WIDOW ROCKFISH	Widow rockfish	Widow rockfish	yes
WDW1	NOM. WIDOW ROCKFISH	Widow rockfish	Widow rockfish	yes
WEEL	WOLF EEL	Other nongroundfish	Other nongroundfish	
WHOO	WAHOO	Other nongroundfish	Other nongroundfish	
WSTG	WHITE STURGEON	Other nongroundfish	Other nongroundfish	
YEY1	NOM. YELLOWEYE ROCKFISH	Yelloweye rockfish	Yelloweye rockfish	yes
YEYE	YELLOWEYE ROCKFISH	Yelloweye rockfish	Yelloweye rockfish	yes
YLTL	YELLOWTAIL	Other nongroundfish	Other nongroundfish	
YMTH	YELLOWMOUTH ROCKFISH	Yellowmouth rockfish (Remaining rockfish)	Other slope rockfish	yes
YSOL	YELLOWFIN SOLE	Other non-FMP flatfish	Other non-FMP flatfish	
YTNA	YELLOWFIN TUNA	Other nongroundfish	Other nongroundfish	
YTR1	NOM. YELLOWTAIL ROCKFISH	Yellowtail rockfish	Yellowtail rockfish (Remaining rockfish)	yes
YTRK	YELLOWTAIL ROCKFISH	Yellowtail rockfish	Yellowtail rockfish (Remaining rockfish)	yes