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Estimated Discard and Catch of Groundfish Species in the 2010 US West Coast Fisheries

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Executive Summary

The primary objective of this report is to estimate fishing mortality for groundfish species in U.S. west coast fisheries during 2010 and evaluate mortality estimates relative to Acceptable Biological Catch (ABC) and Optimum Yield (OY) harvest management goals. Both of these management goals are published each year in the federal groundfish regulations for selected groundfish species (50 CFR 660 Subpart G). Our primary findings include:

- Estimated fishing mortality for darkblotched rockfish exceeded the 2010 OY specification by 1% (332 mt versus an OY of 330 mt). The darkblotched rockfish 2010 ABC (440 mt) was not exceeded.
- Estimated fishing mortality for longnose skate exceeded the 2010 OY specification by 3% (1387 mt versus an OY of 1349 mt). The longnose skate 2010 ABC (3269 mt) was not exceeded.
- Twenty-six groundfish species or species groups (65%) had fishing mortality estimates which were less than 50% of 2010 OY harvest specifications.
- A majority (52%) of the groundfish species or species groups showed a decrease in estimated mortality from 2009 to 2010.
- Sablefish (north of 36° N. latitude) fishing mortality was estimated to be 95% of its OY.

Summaries of 2010 catch from the following groundfish fishery sectors are included (*Sectors where observer program data is used):

Commercial -

- Limited entry (LE) bottom trawl*
- LE bottom trawl - targeting California halibut*
- Open access (OA) bottom trawl - targeting California halibut*
- OA fixed gear nearshore (Oregon/California)*
- Fixed gear LE sablefish primary season (tier endorsed)*
- Fixed gear LE non-primary sablefish (non-endorsed and daily trip limit sectors)*
- Fixed gear OA daily trip limit*
- At-sea Pacific hake/whiting catcher-processor*
- At-sea Pacific hake/whiting mothership*
- At-sea Pacific hake/whiting tribal*
- Exempted fishing permit (EFP)*
- LE mid-water trawl (shoreside hake)¹

Non-commercial –

- Tribal (shoreside fisheries)
- Recreational (Washington/Oregon/California)
- Research

¹LE mid-water trawl (shoreside hake) sector is monitored by the NMFS NW Regional Office through electronic camera systems

Other non-groundfish fisheries included with incidental catch of groundfish species:

Commercial -

OA shrimp trawl – north of 40° 10' N latitude (Washington/Oregon/California)*

OA shrimp trawl – south of 40° 10' N latitude

OA mid-water trawl

OA non-mid-water trawl – not targeting California halibut

Other gear groups - not trawl, shrimp trawl, or fixed-gear

Fixed gear targeting non-groundfish

Data Sources

Data sources used to estimate groundfish fishing mortality include landing receipts (fish tickets), trawl logbooks, onboard observers, recreational catch, research catch, and others.

Fleet-wide landing receipts (fish tickets) are the cornerstone of retained catch information for all sectors of the commercial groundfish fishery on the US west coast. Fish tickets are trip-aggregated sales receipts issued to vessels by fish-buyers in each port for each delivery of fish. They are provided to fish-buyers by a state agency and must be returned to the agency for processing. Fish tickets are designed by the individual states, and Washington, Oregon, and California each have a slightly different format of receipt. In addition, each state conducts species-composition sampling for numerous market categories that are reported on fish tickets. Market categories represent either a single species or a mixture of species. Fish ticket and species-composition data are submitted by state agencies to the Pacific Fisheries Information Network (PacFIN) regional database, which is maintained by the Pacific States Marine Fisheries Commission (PSMFC). Percentages for the species composition within market categories were applied to the fish ticket data used in our analyses. As such, landed weights from sampled market categories were distributed to individual species whenever possible.

Logbook record-keeping is a state-mandated requirement for the LE groundfish trawl sector in Washington, Oregon, and California. A common-format logbook is used by all three states and completed logbook information is entered into state agency databases. The electronic logbook data are then submitted by state agencies to the PacFIN regional database.

Fish ticket landings data and trawl logbook data for the calendar year 2010 were retrieved from the PacFIN database and divided into various sectors of the groundfish fishery as indicated in Figure 1. All additional data processing steps are described in the methods section below. Logbook data from the open-access (OA) groundfish trawl sector were not included in our analyses.

Discard estimation focused on commercial groundfish fishery sectors with scientific at-sea observations of discards, conducted by the Northwest Fishery Science Center (NWFSC) Fishery Resource Analysis and Monitoring Division (FRAM). The West Coast Groundfish Observer Program (WCGOP) and the At-Sea Hake Observer Program (A-SHOP) observe distinct sectors of the groundfish fishery. The WCGOP observes a number of different sectors of the groundfish fishery, including the limited entry (LE) groundfish bottom trawl, limited entry and open access (OA) fixed gear, and state-permitted nearshore fixed gear sectors. The WCGOP also observes several fisheries that incidentally catch groundfish, including the California

halibut trawl and pink shrimp trawl fisheries. WCGOP data from each of these groundfish sectors and fisheries were used for the purposes of discard estimation. Observations by the A-SHOP from the catcher-processor, mothership, and tribal components of the at-sea Pacific hake/whiting fishery were also summarized as mortality estimates in this report.

The WCGOP was established in 2001 by NOAA Fisheries (National Marine Fisheries Service, NMFS) (66 FR 20609). All commercial vessels that land groundfish caught in the United States Exclusive Economic Zone (EEZ) from 3-200 miles offshore are required to carry an observer when notified to do so by NMFS or its designated agent. Subsequent state rule-making also require vessels that fish for groundfish within 3 miles of shore or participate in other state-managed fisheries to carry WCGOP observers when notified. The WCGOP's goal is to improve total catch estimates by collecting information on the discarded catch (fish returned overboard at-sea) of west coast groundfish species. For more details about WCGOP goals, vessel selection, and data collection, see the WCGOP website at <http://www.nwfsc.noaa.gov/research/divisions/fram/observer/>. The website also provides estimates of observer coverage, observed catch, and a summary of observed fishing depths for each sector. A list of fisheries, in order of coverage priority and detailed information on data collection methods employed in each observed fishery can be found in the WCGOP manual (NWFSC 2010).

The sampling protocol employed by the WCGOP is primarily focused on the discarded portion of catch. To ensure that recorded weights for the retained portion of the observed catch are accurate, haul-level retained catch recorded by WCGOP observers are reconciled with trip-level fish ticket records. The WCGOP data are linked to fish tickets by fish ticket identification numbers obtained by the observer and are adjusted so that the total trip pounds of retained catch equals the total trip pounds on the fish ticket(s). This is done because the fish ticket weight is more accurate and fish tickets are legally binding documents. These steps are described in further detail on the WCGOP website under Data Processing, and in prior reports produced annually by the WCGOP at <http://www.nwfsc.noaa.gov/research/divisions/fram/observer/>. All additional data processing steps are described in the methods section below.

The At-Sea Hake Observer Program (A-SHOP) has conducted observations of the west coast at-sea Pacific hake/whiting fishery since 2001. Prior observations were conducted by the North Pacific Groundfish Observer Program. A-SHOP program information and documentation on data collection methods can be found in the observer manual (NWFSC 2010). The at-sea hake/whiting fishery has mandatory observer coverage, with each vessel over 38 m carrying two observers. However, catcher vessels which deliver catch to motherships are not observed.

Each year, a certain portion of the OY and ABC for groundfish species is harvested through various research activities. In 2010, research programs that caught groundfish included the NWFSC's groundfish bottom trawl survey, a hook and line survey, and the International Pacific Halibut Commission's (IPHC) longline survey, as well as other scientific research permits. All groundfish research catch information was provided to NOAA's Northwest Regional Office (NWR). These data were then summarized by the NWR and included in this report.

In addition to these data sources, further information provided by the Groundfish Management Team (GMT) was also used in the total mortality estimation process. The GMT is an advisory body to the PFMC that is comprised of representatives from federal, state, and Tribal agencies and is involved in evaluating

management performance and alternatives for groundfish fisheries between the U.S. borders with Canada and Mexico. For the purposes of this analysis, the GMT provided mortality rates, which are assumptions regarding the survival of discards, for sablefish and lingcod in the trawl and fixed gear sectors and for the major species groups reported in the state-permitted fixed gear nearshore sector.

Methods

Discard Estimation Methods

We used a deterministic approach to estimate discard mortality for all WCGOP observed sectors of the groundfish fishery. Through this approach, observed discard rates for each species were directly expanded to the fleet-wide level. First, discard ratios were computed from observer data as the discarded weight of a particular species/species group divided by the weight of retained catch of either all groundfish (excluding Pacific hake), sablefish, or other species based on the targeting behavior of that sector. Discard ratios were then multiplied by the fleet-wide landed weight of groundfish, sablefish or other species (depending on the denominator used to compute observed discard ratios). This provided an expanded estimate of fleet-wide discard weight for each species. Because of differences in data availability and management structure among sectors of the groundfish fishery, this approach was applied with slight modifications for each sector. Each of these modifications is detailed in the methodology for each sector below.

In all cases where a FMP groundfish species grouping or nearshore species grouping was used to compute discard ratios, any retained weights that were recorded by the observer but that did not appear on fish tickets were excluded from the denominator. This was necessary to prevent double-counting associated with differences in the species codes used by observers and processors. For instance, while observers may record rockfish catch at the species level, various species of rockfish are often grouped, weighed, and recorded together on the fish ticket under a grouped species code such as NUSP - northern unspecified slope rockfish. By using only the retained groundfish weight from fish tickets in discard ratio denominators, we prevent double-counting of retained weights. This is not an issue when using a single species in the denominator, such as sablefish in the fixed gear fisheries (see below), as any retained weights in observer and fish ticket data that share the same species code will match and adjust properly.

Species were defined and/or grouped for this report according to the WCGOP Data Processing Appendix, which can be found at: <http://www.nwfsc.noaa.gov/research/divisions/fram/observer/>. A complete listing of groundfish species is defined in the Groundfish Fishery Management Plan (<http://www.pcouncil.org/wp-content/uploads/fmpthru19.pdf>). Groundfish species that are currently being managed under rebuilding plans are presented separately from non-rebuilding species.

In all tables, (-) was used when there is no actual numeric value (i.e., the species was not caught). Values appear as 0.0 when a value exists but is smaller than the decimal places allotted. A value of NA represents that the calculation is not applicable for a particular species or stratum, or that the calculation did not produce a result (e.g., very small values might result in NA from a standard error calculation). Grey shading indicates that values include estimates of both discard and retained catch.

Limited Entry Bottom Trawl Sector

Fleet-wide discard estimates for the LE bottom (non-mid-water) trawl sector were derived from WCGOP observer data, fish ticket landings data, and trawl logbook data (Figure 1). For a description of the LE bottom trawl sector, vessel selection, observer coverage, vessel waivers, and prior LE bottom trawl sector reports, see: <http://www.nwfsc.noaa.gov/research/divisions/fram/observer/>.

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

Several additional filtering steps were then applied to the data to ensure that we had distinguished data for the LE bottom trawl sector appropriately. We investigated tows and landings with more than 2 mt of Pacific hake, to exclude effort that was targeted exclusively towards this species. On the basis of the Pacific hake catch criterion, one logbook tow in 2010 met the criterion and was removed. Next, 15 trawl logbook tows lacking a recorded depth were removed to ensure that all spatial and depth information was complete.

Observer data and trawl logbook data were then stratified by management area, depth, and season (Table 1). Records were separated into two groundfish management areas, north and south of 40° 10' N. latitude. Each management area was divided into three depth strata (0-125, 126-250, >250 fathoms). Two-month cumulative trip limit periods were combined to form two seasonal strata: winter (November-April) and summer (May-October). In some cases, if the numbers of observations were too limited, data were aggregated across seasons. In the north, data were combined across seasons in the shallowest depth stratum (0-125 fathoms). In the south, data were combined across seasons in the mid-depth stratum (126-250 fathoms). Table 1 presents the spatial and temporal distribution of tows and retained FMP groundfish (excluding Pacific hake) weight in the 2010 observer and trawl logbook data.

It should be noted that the stratification scheme used in this analysis is inconsistent with the sampling design employed by the WCGOP. The authors recognize this fact, but used this method to provide estimates that were relevant within the spatial and temporal structure of groundfish management. The validity of stratification in terms of isolating variance in discard has not yet been objectively tested. Until more work can be completed to evaluate which strata (area/depth/season) are most appropriate for discard analyses, broader stratification is often warranted to ensure adequate sample size or to meet confidentiality mandates. The depth strata used in the present analysis highlight the areas shoreward and seaward of RCA closures relevant in the fishery management framework and provide consistency when evaluating discard or bycatch over time, as depth-based spatial closures change.

Measures of uncertainty are not provided within the context of the WCGOP sampling design, as they would be biased by post-stratification. However, standard errors consistent with Pikitch et al. (1998) are provided for all observed discard ratios in the context of the post-stratified analysis. The standard errors are most likely an underestimate of the actual uncertainty, but are the sole measure we can provide at this time.

Once data had been stratified, discard ratios were computed from the observer data and multiplied by logbook catch weights in each stratum (Figure 2). This was done according to the following equation:

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

where:

- s*: species or species group
- x*: index strata (area, depth, season)
- a*: state of landing (Washington, Oregon or California)
- b*: bimonthly period (Jan-Feb, Mar-Apr, ... , Nov-Dec)
- t*: tows
- d*: observed discard weight of species *s*
- r*: observed retained weight of all FMP groundfish excluding Pacific hake
- R*: weight of retained FMP groundfish (excluding Pacific hake) recorded in logbooks
- \hat{D} : initial discard estimate for species *s* in stratum *x*, state *a* and bimonthly period *b*

Discard ratios and standard errors for the LE bottom trawl sector are presented in Tables 2a-2b. Pacific hake was excluded when using the retained FMP groundfish denominator because vessels that target or land large amounts are considered to be part of Pacific hake mid-water trawl sectors, which are distinct from the LE groundfish bottom trawl sector.

Although retained logbook weights of FMP groundfish (excluding Pacific hake) were initially used to expand observed discard ratios to the fleet-wide level in this sector, logbooks are not submitted for 100% of trawl trips and therefore do not capture all groundfish bottom trawl fishing effort. As a result, it was necessary to adjust initial fleet level discard estimates to reflect the level of effort indicated by fish ticket landings. To do this, both fish ticket and logbook data were aggregated by state and bimonthly periods (Figure 2) associated with cumulative trip limits. An adjustment ratio was then computed for each state and bimonthly period as the weight of FMP groundfish (excluding Pacific hake) recorded on fish tickets divided by that recorded in logbooks. Each adjustment ratio was multiplied by coinciding discard estimates and then summed across bimonthly periods, states, and spatial-temporal strata to produce coast-wide adjusted discard estimates for each species:

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

where:

- F*: weight of retained FMP groundfish (excluding Pacific hake) recorded on fish tickets
- $adj(\hat{D}_s)$: adjusted discard estimate for species *s*

Adjustment ratios were computed separately for each state and bimonthly period to account for differences between individual states' logbook submission rates and fish ticket recording methods. An adjustment ratio value less than 1 indicated that more FMP groundfish weight was recorded in logbooks than on fish tickets. Conversely, adjustment ratios greater than 1 occurred when fish ticket FMP groundfish weights were larger than logbook weights. In 2010, the value of the adjustment ratios computed for the LE bottom trawl sector ranged between 0.716 and 1.214 (mean of 1.033). Only three state-bimonthly period strata had ratios less than 1, which occurred from January through February, in Washington and California, and from July through

August in Washington. The largest adjustment ratio occurred in Washington from May through June. The majority of adjustment ratios for state and bimonthly periods were slightly larger than 1.

Coast-wide landings, final discard estimates, and estimated fishing mortality in the 2010 LE groundfish bottom trawl sector are reported in Table 3. A 50% mortality rate was applied to discarded sablefish and lingcod weight, which is a historical legacy and assumption from the GMT.

California Halibut Bottom Trawl Fishery

For a description of the California halibut bottom trawl sector, vessel selection, observer coverage, vessel waivers, and prior California halibut bottom trawl sector reports, see: <http://www.nwfsc.noaa.gov/research/divisions/fram/observer/>.

Fleet-wide discard estimates in the California halibut bottom trawl fishery were derived from WCGOP observer data and fish ticket landings data. Although all California halibut vessels are permitted by the state of California, we consider this fishery to consist of both a limited entry and an open access component (vessels that do not have federal limited entry groundfish permits). The WCGOP provides observer coverage under the LE groundfish bottom trawl sector and isolates data for the LE component of the California halibut fishery based on the following criteria: 1) the tow target was California halibut or 2) the tow target was nearshore mix, sand sole or other flatfish, and the tow took place in less than 30 fathoms, south of 40°10' N. latitude. All tows in the observer data that met at least one of the above requirements were included in the LE California halibut bottom trawl dataset. The WCGOP randomly samples the OA California halibut sector separately. These two components of the observed California halibut trawl fishery (LE and OA) were combined in this 2010 analysis to ensure sufficient sample size and to meet confidentiality mandates.

Discard ratios were computed for the combined (LE and OA) observed data using the retained weight of California halibut in the denominator. For individual LE and OA sectors, the fleet landed weight of California halibut was then used as a multiplier to expand observed discard ratios to the fleet (Table 4). Fleet-wide landings were compiled from “non-mid-water” trawl fish tickets (see Figure 1) for those vessels that had a state-issued California halibut bottom trawl permit.

Discard estimates were computed for each sector based on the following equation:

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

where:

- s : species or species group
- t : observed tows
- d : observed discard weight of species s
- r : observed retained weight of California halibut
- F : weight of retained California halibut recorded on fish tickets
- \hat{D}_s : discard estimate for species s

Although FMP groundfish and California halibut weights from the same fish tickets were used to adjust initial LE groundfish bottom trawl estimates and to expand discard ratios for the LE California halibut fleet, this is

not anticipated to be a major source of bias in our analysis, as the primary species retained on observed California halibut tows were non-groundfish. However, because some flatfish species were retained on these tows, it is possible that estimates for the shallowest strata in California for the LE groundfish bottom trawl sector could have been positively biased due to slightly larger adjustment ratios (caused by the inclusion of landed flatfish weight that was in fact caught on California halibut tows). Examination of the species composition on fish tickets in the areas where California halibut is typically landed suggests that the impact of this is minor. Given that groundfish are regularly discarded by the LE California halibut fishery, we felt that it was more appropriate to estimate discard for this fishery than to exclude LE California halibut discard estimates altogether from this report.

Table 5 presents estimated mortalities of species caught in the 2010 California halibut trawl fishery. A 50% mortality rate was applied for discarded lingcod, which is a historical legacy and assumption from the GMT. in the LE bottom trawl sector. Because limited entry vessels participating in the California halibut fishery often land catch at the same time as catch from bottom trawl tows targeting groundfish, it was not possible to split out landed weights for groundfish species from those reported in the LE bottom trawl sector. Joint groundfish landings for the LE bottom trawl sector and for LE vessels targeting California halibut are presented in Table 3.

Pink Shrimp Trawl Fishery

Fleet-wide discard estimates for the pink shrimp trawl fishery were derived from WCGOP observer data and fish ticket landings data (Figure 1). For a description of the pink shrimp trawl sector, vessel selection, observer coverage, vessel waivers, and prior pink shrimp trawl sector reports, see: <http://www.nwfsc.noaa.gov/research/divisions/fram/observer/>.

Discard ratios for this fishery were calculated by dividing the observed discard weight of each species or species group by the observed retained weight of pink shrimp (Table 6). The fleet landed weight of pink shrimp was then used as a multiplier to expand observed discard ratios to the fleet. The equation for the expansion of pink shrimp discard ratios is identical to that presented for the California halibut fishery, but where r represents the retained weight of pink shrimp and F represents the weight of retained pink shrimp recorded on fish tickets. Because observer data in 2010 were only available north of 40°10' N. latitude, only pink shrimp fish tickets in the north were compiled for the expansion. We assumed combined discard rates for all state pink shrimp fleets in the north. WCGOP coverage of the Washington pink shrimp fleet began in 2010 and is utilized for the first time in this report. Pink shrimp landings from south of 40°10' N. latitude are summarized as part of the remaining incidental fisheries landings in Table 18. Table 7 presents landings, final discard estimates, and total fishing mortality in the 2010 pink shrimp trawl fishery.

Non-Nearshore Fixed Gear Sector

Fleet-wide discard estimates for the LE and OA non-nearshore fixed gear sector of the groundfish fishery were derived from WCGOP observer data and fish ticket landings data. For a description of the fixed gear sectors, vessel selection, observer coverage, vessel waivers, and prior fixed gear sector reports, see: <http://www.nwfsc.noaa.gov/research/divisions/fram/observer/>.

Fish tickets for fixed gear that did not have recorded sablefish or nearshore species were included in the non-nearshore fixed gear sector only if groundfish landings were greater than non-groundfish landings based on a

unique vessel and landing date (Figure 1). If non-groundfish landings were greater than groundfish landings, those fixed gear fish tickets (which also did not have recorded sablefish or nearshore species) were summarized in Table 18 incidental landings. The commercial fixed gear fish tickets with recorded nearshore species weight were not used in this portion of the fixed gear analysis, regardless of whether they included recorded weights for sablefish. These fish tickets were instead included in the nearshore fixed gear groundfish sector (see next section).

Fish tickets were partitioned into three commercial fixed gear subsectors: LE sablefish primary, LE sablefish non-primary, and OA fixed-gear groundfish. Commercial fixed gear fish tickets were first divided out by whether the vessel had a federal groundfish permit (limited entry) or no federal groundfish permit (open access). OA fish tickets were placed in the OA fixed gear groundfish subsector. Next, LE fish tickets were separated based on whether the vessel's federal groundfish permit(s) had a sablefish endorsement (sablefish-endorsed) with tier quota for the primary season or whether it was not endorsed (also referred to as '0' tier permits). The LE sablefish primary season takes place from April through the end of October. Fish tickets for all LE sablefish vessels with tier endorsements that were operating within this period and within their allotted tier quota were placed in the LE sablefish primary subsector. If LE sablefish-endorsed vessels fished outside of the primary season (November through March) or made trips within the season after they had reached their cumulative tier quota, the fish tickets were placed in the sablefish non-primary subsector. In addition, fish tickets from non-endorsed LE vessels were also placed in the sablefish non-primary subsector.

Data used in our analyses were collected by WCGOP from the following fixed gear subsectors in order of priority: LE sablefish-endorsed primary season fixed gear, LE '0' tier (non-endorsed) and OA fixed gear (non-nearshore). LE sablefish-endorsed vessels that were fishing outside of the primary season or that had reached their cumulative tier quota in the primary season were not observed.

Observer data were stratified by subsector, area, and gear group (where applicable) (Table 8). Area strata were based on PFMC area management for sablefish trip limits and correspond to: north of 40° 10' N. latitude, from 40° 10' to 36° N. latitude, and south of 36° N. latitude. Data were summarized separately for longline and pot/trap gear groups. If landings were made by a fixed gear subsector for which there were no or very few WCGOP observations, the most appropriate observed discard ratios were selected and applied to these landings based on similarities in the fishery management structure, fishing and discard behavior, and the gear fished. For example, the OA fixed gear subsector landed 52.2 mt of sablefish between 40° 10' N. and 36° N. latitude with longline gear in 2010 but only a small portion of the fleet was observed by the WCGOP program in this stratum (Table 11). Given similarities in gear type and catch composition, LE non-endorsed sablefish data were selected as the most appropriate source of information to supplement observer data from OA fixed gear vessels. Observer data from both sources were combined to compute a discard ratio, which was then multiplied by the OA fixed gear longline landings in this area to generate estimated discard.

Explicit depth stratification of fixed gear fishing effort is not possible because there are no fleet-wide estimates of fishing depths. However, management restricted fixed gear fishing to depths greater than 100 fathoms in the area north of 40° 10' N. latitude, with the exception of fishing greater than 125 fathoms from 45° 3.83' to 43° N. latitude, and to depths greater than 150 fathoms in the area south of 40° 10' N. latitude.

The number of observed vessels, trips, and sets are summarized for each subsector in Tables 9-11, along with sablefish and FMP groundfish (excluding Pacific hake) fleet landings used as a measure for expanding discard

from observed trips to the entire fleet. Discard ratios in the two areas north of 36° N. latitude were calculated by dividing the stratum discard weight of each species by the observed retained catch weight of sablefish. Discard ratios for all species in the area south of 36° N. latitude were calculated by dividing the stratum discard weight of each species by the retained catch weight of all FMP groundfish species excluding Pacific hake. Retained groundfish was used as the denominator in this area rather than sablefish weight alone because fixed gear fisheries south of 36° N. latitude have a wider range of target species. A broader denominator was therefore necessary in order to effectively capture their level of fishing effort.

Stratum estimated discard for all subsectors were then summed for each area and summed coast-wide. Coast-wide landings, final discard estimates, and estimated fishing mortality are reported in Table 12 for the 2010 LE and OA non-nearshore fixed gear sectors combined. A 20% mortality rate is applied for discarded sablefish, as assumed by the GMT.

Nearshore Fixed Gear Sector

Fleet-wide discard estimates for the commercial nearshore fixed gear sector of the groundfish fishery were derived from WCGOP observer data, fish ticket landings data (Figure 1), and mortality rates provided by the GMT. For a description of the nearshore fixed gear sector, vessel selection, observer coverage, vessel waivers, and prior nearshore fixed gear sector reports, see: <http://www.nwfsc.noaa.gov/research/divisions/fram/observer/>.

The WCGOP provides coverage for the commercial nearshore fisheries in California and Oregon based on a selection process of state-issued nearshore permits/licenses. Although California and Oregon nearshore fisheries are sampled separately for observer coverage, fleet-wide discard estimates are provided for the areas north and south of the groundfish management line at 40° 10' N. latitude, in accordance with 2010 federal groundfish management specifications.

Mortality rates provided by the GMT differ for each species according to depth. In December 2007, the GMT provided a slightly revised suite of depth-specific discard survival assumptions for nearshore species. It was therefore necessary to generate discard estimates in each of the three depth intervals employed by the GMT (0-10, 11-20, > 20 fathoms). The percentage of catch for each species or species group by depth was calculated based on summarized observer data from 2003-2010 (Table 13). Fleet landings of each nearshore species or species group in 2010 were then distributed among depth intervals using the percentages computed in the previous step. Finally, the total distributed landed weights of all nearshore groundfish species within each depth stratum were used to expand observed discard to the fleet level.

Prior to the calculation of discard ratios in this sector, WCGOP observer data were stratified by area and depth (Table 14). In the area north of 40° 10' N. latitude, data were combined in the two deepest depth strata (11-20 and > 20 fathoms) to ensure an adequate sample size. Discard ratios were calculated by dividing the stratum discard weight of each species or species group by the retained weight of nearshore species.

Observed discard ratios (Table 14) were multiplied by the allocated landed weight of all nearshore groundfish species within each depth stratum (Table 13). These fleet-level estimates of gross discard within each stratum were then multiplied by depth-specific discard mortality rates (provided by the GMT) to generate estimates of discard mortality in each stratum (Table 15a-b). Final discard estimates for each area were obtained by summing estimates of discard mortality across depth strata. Gross discard estimates, discard mortality rates,

estimated discard mortality, and fishing mortality estimates in the 2010 nearshore fixed gear sectors north and south of 40° 10' N. latitude are reported in Tables 15a-15b.

Discard Estimation Summary

The estimated fishing mortalities of major U.S. west coast groundfish species are reported by sector/fishery in Table 16 for specific areas or groups consistent with ABC and OY guidelines. This table includes only the sectors/fisheries for which WCGOP observer data were available.

Bycatch estimation and summaries for several additional fish species observed by the WCGOP are available in separate reports; Pacific halibut is provided in Jannot et al. 2011, salmon species are provided in Bellman et al. 2011a, and green sturgeon and eulachon are provided in Bellman et al. 2011b.

Other Commercial Data Summaries

The mid-water trawl fishery for Pacific hake/whiting is comprised of several at-sea processing fleets. The three at-sea processing sectors include: catcher-processors, motherships (with non-tribal catcher boats), and a tribal fleet delivering to motherships. Observer data was used exclusively for all at-sea sectors from the At-Sea Hake Observer Program (A-SHOP). The objective of observation in this program is to produce estimates of total catch in the fishery. Observers do not estimate or report amounts of discard separately. However, they provide visual estimates of the proportions of catch that are discarded. These proportions form the basis of the retained and discarded catch amounts summarized in Table 17. All at-sea sectors for Pacific hake are summarized in Table 19 as 'All at-sea hake fisheries'. For more information on the at-sea hake sectors, see: <http://www.nwfsc.noaa.gov/research/divisions/fram/observer/>.

In addition, there is also a Pacific hake fleet which delivers to shoreside processors. The 2010 shoreside hake fishery was conducted under an Exempted Fishing Permit (EFP). Under this EFP, participants placed all of their catch directly into refrigerated tanks, rather than sorting the catch on deck, to preserve fish quality. They are allowed to avoid penalties for catch weights which go over their allotted trip-limits at the time of landing. This is described as a "maximum" retention fishery. Summaries of catch in the shoreside hake mid-water trawl fleet are included in Table 17. The summary is also included in Table 19 as 'Shoreside hake mid-water trawl'. The summary of retained catch is based exclusively on fish ticket data assigned to this fishery using the classification system outlined in Figure 1, and then combining any commercial trawl mid-water gear and any EFP mid-water trawl gear fish tickets. An additional estimate of Pacific hake discard (214 mt) was incorporated, based on electronic monitoring (EM) data and Office of Law Enforcement (OLE) reports (Lori Jesse, NMFS NW Regional Office, personal communication).

Landings of groundfish species from the WA tribal shoreside fisheries are summarized in Table 19. The summary of this fishery is based exclusively on fish ticket data assigned to this fishery using the classification system outlined in Figure 1. Discard estimates for WA tribal shoreside fisheries were not available. Tribal directed groundfish fisheries employ full retention requirements. In addition, full retention is monitored by a target tribal observation rate of 15% for Makah trawl fisheries. Discard mortality of fixed gear sablefish is accounted for in tribal management by reducing the tribal allocation to account for discard mortality. For more information on discard and retention in tribal sablefish fisheries and Makah trawl observations, see Appendix B of the 2011-2012 groundfish harvest specifications (PFMC and NMFS 2011).

Groundfish species catch from the recreational fisheries are summarized in Table 19. The summary of these fisheries is based exclusively on data provided by the state agencies: the Washington Department of Fish and Wildlife, the Oregon Department of Fish and Wildlife, and the California Department of Fish and Game. The state agencies provide catch weight (discarded + retained) estimates with PFMC-approved depth dependent mortality rates applied to account for discard mortality.

Research catch of groundfish species is summarized in Table 19, based on data provided by the NOAA Northwest Regional Office. Catch weight (discarded + retained) was summarized from reporting of scientific research permits that directly or indirectly caught groundfish off the U.S. west coast. Discarded and retained catch varies by research permit, and the summary reported here includes catch from permits with only retained catch, some tagging study catch where all fish were released alive, combined discarded and retained catch, etc. Research catch was summarized for all gear types employed.

Landings of groundfish species from other non-groundfish fisheries operating under federal open access landing limits, which are mostly state-managed and incidentally catch groundfish, are also summarized in Table 19 as 'Incidental fisheries'. The fisheries included in this summary are listed in the Introduction section. A more detailed breakdown of incidental landings is provided in Table 18. The summary of these fisheries was based exclusively on fish ticket data, with the exception of one WCGOP observed EFP (conducted by The Nature Conservancy) which supplied discard catch as well. It was not possible to provide discard estimates for the remaining incidental fisheries. In Table 18, data from PacFIN that is listed under the heading "EFP (Excluding Midwater Trawl)", includes cumulative groundfish landings for EFP's conducted in all fisheries, not simply those under the groundfish management plan. Fish tickets associated with the Pacific halibut directed commercial fishery were isolated based on landed catch of Pacific halibut recorded on the fish ticket on the day of the opening or within two subsequent days.

Results

In Table 20, fishing mortality estimates are evaluated in terms of 2010 OY and ABC harvest specifications from federal groundfish regulations (50 CFR 660 Subpart G). The ABCs for all rebuilding groundfish species were not exceeded in 2010. OY specifications for rebuilding species in 2010 relative to 2009 increased for darkblotched and Pacific ocean perch, remained the same for bocaccio, canary and cowcod rockfish, and decreased for widow and yelloweye rockfish (75 FR 39178).

The results indicate that for one of the rebuilding groundfish species, darkblotched rockfish, the fishing mortality estimate (332 mt) exceeded its OY (330 mt) by 1% (Table 20). The darkblotched rockfish OY increased by 45 mt relative to 2009. In response to a federal court ruling in April 2010, the NMFS darkblotched rockfish OY of 330 mt was adopted, which was higher than the original 291 mt OY specified in regulations. Estimated mortality of darkblotched rockfish increased for the second consecutive year (332 mt at 101% of OY in 2010; 301 mt at 106% of OY in 2009; 253 mt at 77% of OY in 2008) (Bellman et al. 2010 and Bellman et al. 2009). Mortality estimates of darkblotched rockfish and Pacific ocean perch were highest in the LE bottom trawl sector (Table 19).

Among other rebuilding species, the largest percentage of estimated mortality in relation to OY was 80% for Pacific ocean perch, with an estimated total fishing mortality of 159 mt and an OY of 200 mt. This proportion of OY (80%) is the lowest since 2006 when the Pacific ocean perch OY was more than double

(447 mt in 2006 compared to 200 mt in 2010). Pacific ocean perch mortality decreased between 2009 and 2010 from 181 mt to 159 mt despite an increase in OY of 11 mt. Pacific ocean perch is managed under the slope rockfish category when caught south of 40° 10' N. latitude, so species-specific estimates are reported only in the area north of this latitude. Thus, additional mortality of Pacific ocean perch at the population level can occur south of 40° 10' N. latitude, but it is not evaluated in groundfish management on an individual species-specific basis.

For other groundfish, only the mortality estimate for longnose skate (1387 mt) was above the 2010 OY (1349 mt) by 3%. This is the second year where the OY (1349 mt in both 2009 and 2010) was exceeded for longnose skate, despite a decrease in estimated mortality of 74 mt between 2009 and 2010. The estimated fishing mortality was still within the 2010 ABC of 3269 mt (Table 20). Estimated mortality of longnose skate was highest in the LE bottom trawl sector, followed by non-nearshore fixed gear sectors (Table 19).

Sablefish mortality in the area north of 36° N. latitude was estimated to be within 5% of its OY (Table 20) (6167 mt at 95% of a 6471 mt OY). Sablefish mortality north of 36° N. latitude decreased by 446 mt between 2009 and 2010, and the OY decreased by 581 mt.

As with all point estimates, mortality values presented in Tables 19 and 20 should be considered with caution. It should be noted that multiple sources of uncertainty were not accounted for in this analysis and may influence mortality estimates. These include uncertainty in sampling of landings for species composition, logbook spatial and depth information, observed retained weights, discard mortality rates, as well as others. Currently, it is not possible to quantify uncertainty for mortality estimates presented in this report, as measures of the variability associated with logbook and fish ticket data sources are not available. However, standard errors have been provided for all observed discard ratios.

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Figures

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

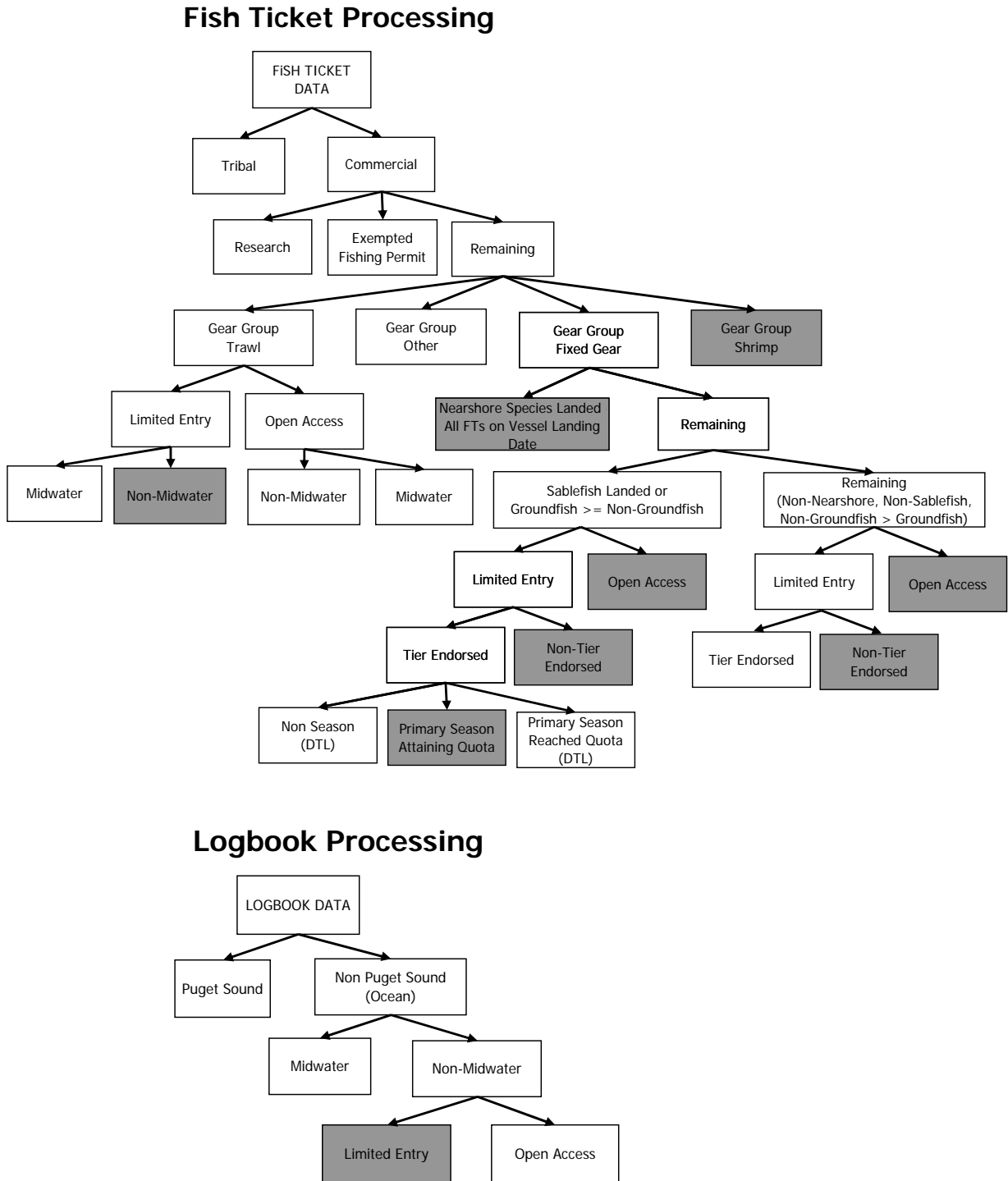
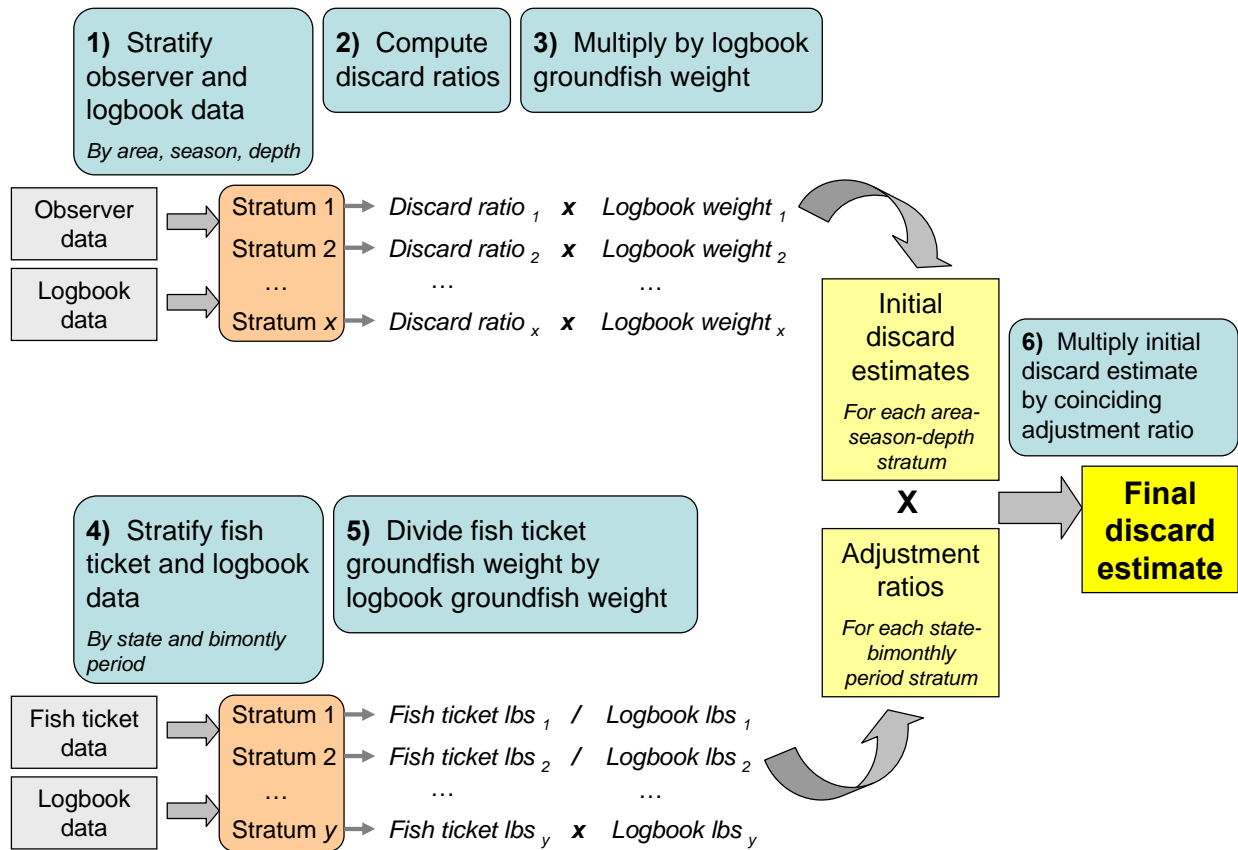


Figure 2. Flow-chart illustrating the process by which WCGOP observer data from the limited entry bottom trawl sector are expanded to the fleet-wide level. Observer data are then assigned to spatial/temporal strata based on latitude, depth, and season. Observed discard ratios are computed and applied to the coinciding logbook weight for each stratum. Finally, an adjustment ratio of the proportion of logbook fish ticket groundfish weight is multiplied by the initial expanded estimate to produce a final discard mortality estimate for each species. See the limited entry bottom trawl methods for further details.



Tables

Note: In all tables, (-) was used when there is no actual numeric value (i.e. the species was neither caught nor discarded). Values appear as 0.0 when a value exists but is smaller than the decimal places allotted. A value of NA represents that the calculation is not applicable for a particular species or strata, or that the calculation did not produce a result (e.g. very small values might result in NA from a standard error calculation). Grey shading indicates that values include estimates of both discard and retained catch.

Table 1. Number of tows and retained weight (mt) of FMP groundfish species (excluding Pacific hake) from observer and logbook data for the 2010 limited entry bottom trawl fishery by depth, season, and management area. Data are combined as needed to ensure adequate sample size. Tows targeting California halibut have been removed. Winter season is January-April and November-December and summer season is May-October.

Depth interval (fathoms)	NORTH of 40°10' N Lat.				SOUTH of 40°10' N Lat.			
	Number of tows		Retained groundfish (mt)		Number of tows		Retained groundfish (mt)	
	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer
Observed fleet								
0-125	422		328.5		65	62	28.4	32.3
126-250	177	370	438.0	879.4	75		61.3	
> 250	482	806	894.7	1199.1	37	120	47.4	191.2
Total	2257		3739.8		359		360.5	
All trawl logbooks								
0-125	2216		1675.3		170	483	102.0	241.1
126-250	1402	1925	3369.3	3912.3	538		535.7	
> 250	2990	2900	5990.1	4125.9	440	615	632.5	969.1
Total	11433		19073.0		2246		2480.4	
Percentage observed								
0-125	19%		20%		38%	13%	28%	13%
126-250	13%	19%	13%	22%	14%		11%	
> 250	16%	28%	15%	29%	8%	20%	7%	20%
Total	20%		20%		16%		15%	

Table 2a. Discard ratios and standard error from observed trips north of 40°10' N latitude in the 2010 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. The 0-125 fm stratum was combined across seasons.

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	<i>Denominator = Retained groundfish (mt)</i>					
Bocaccio	winter	--	--	--	--	--	--
	summer						
Canary rockfish	winter	0.0001	0.0045	0.0000	NA	--	--
	summer			0.0000	NA	0.0000	0.0029
Darkblotched rockfish	winter	0.0059	0.0893	0.0099	0.0825	0.0047	0.1156
	summer			0.0102	0.0690	0.0033	0.0696
Pacific ocean perch	winter	0.0047	1.2929	0.0008	0.0119	0.0001	0.0020
	summer			0.0103	0.0938	0.0017	0.0479
Widow rockfish	winter	0.0001	0.0055	0.0000	0.0026	0.0000	0.0003
	summer			0.0038	0.5330	0.0006	0.1348
Yelloweye rockfish	winter	--	--	--	--	--	--
	summer			0.0000	NA	0.0000	NA
Non-rebuilding species							
Arrowtooth flounder	winter	0.0938	0.2311	0.0944	0.2695	0.0151	0.0601
	summer			0.0229	0.0992	0.0103	0.0882
Big skate	winter	0.0168	0.0853	--	--	--	--
	summer			0.0002	0.2901	0.0001	NA
Black rockfish (North of 46°16' N. lat.)	winter	--	--	--	--	--	--
	summer			--	--	--	--
Black rockfish (South of 46°16' N. lat.)	winter	--	--	--	--	--	--
	summer			--	--	--	--
Cabazon (Oregon)	winter	--	--	--	--	--	--
	summer			--	--	--	--
California skate	winter	--	--	--	--	--	--
	summer			--	--	--	--
Chilipepper rockfish	winter	--	--	--	--	--	--
	summer			--	--	--	--
Dover sole	winter	0.0123	0.0416	0.0146	0.0833	0.0206	0.0805
	summer			0.0063	0.0677	0.0350	0.0848
English sole	winter	0.0400	0.0801	0.0008	0.0120	0.0000	0.0009
	summer			0.0000	0.0003	--	--
Greenspotted rockfish	winter	0.0000	NA	--	--	--	--
	summer			0.0000	NA	--	--
Greenstriped rockfish	winter	0.0022	0.0581	0.0000	NA	0.0000	NA
	summer			0.0001	0.0111	0.0000	0.0014
Grenadiers	winter	--	--	0.0000	0.0020	0.0063	0.0602
	summer			0.0000	0.0018	0.0167	0.1017
Kelp greenling	winter	0.0000	0.0241	--	--	--	--
	summer			--	--	--	--
Lingcod (North of 42° N. lat.)	winter	0.0057	0.0321	0.0014	0.0484	0.0000	0.0017
	summer			0.0000	0.0015	0.0000	0.0003
Lingcod (South of 42° N. lat.)	winter	0.0001	0.0138	--	--	--	--
	summer			--	--	--	--
Longnose skate	winter	0.0139	0.0307	0.0139	0.0502	0.0040	0.0148
	summer			0.0168	0.0331	0.0049	0.0142
Longspine thornyhead	winter	0.0000	NA	0.0004	0.0031	0.0264	0.0674
	summer			0.0015	0.0222	0.0375	0.0581
Mixed thornyheads	winter	--	--	--	--	0.0016	0.2129
	summer			0.0002	0.2109	0.0022	0.4293

Table 2a (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	<i>Denominator = Retained groundfish (mt)</i>					
Other flatfish	winter	0.1228	0.0725	0.0032	0.0240	0.0035	0.0792
	summer			0.0019	0.0243	0.0003	0.0032
Other groundfish	winter	0.0143	0.0569	0.0066	0.0543	0.0014	0.0182
	summer			0.0052	0.0287	0.0019	0.0231
Other nearshore rockfish	winter	--	--	--	--	--	--
	summer			--	--	--	--
Other shelf rockfish	winter	0.0009	0.0457	0.0003	0.0066	0.0000	0.0037
	summer			0.0006	0.0124	0.0001	0.0100
Other slope rockfish	winter	0.0010	0.0364	0.0023	0.0078	0.0006	0.0029
	summer			0.0208	0.0305	0.0036	0.0187
Pacific cod (North of 43° N. lat.)	winter	0.0000	0.0015	--	--	--	--
	summer			--	--	--	--
Pacific hake	winter	0.0288	0.4056	0.0212	0.0835	0.0087	0.0827
	summer			0.0229	0.0730	0.0091	0.0660
Petrale sole	winter	0.0160	0.0272	0.0231	0.1192	0.0017	0.0425
	summer			0.0000	0.0009	0.0000	0.0003
Redstripe rockfish	winter	--	--	0.0000	0.0052	--	--
	summer			0.0000	0.0007	0.0000	0.0021
Sablefish (North of 36° N. lat.)	winter	0.0344	0.1981	0.0336	0.1078	0.0134	0.0251
	summer			0.0216	0.0596	0.0175	0.0423
Sharpchin rockfish	winter	0.0001	0.0405	0.0004	0.0736	0.0000	0.0062
	summer			0.0016	0.6077	0.0000	NA
Shortspine thornyhead	winter	0.0006	0.0089	0.0025	0.0094	0.0040	0.0147
	summer			0.0048	0.0131	0.0048	0.0110
Silvergray rockfish	winter	--	--	0.0001	0.2197	--	--
	summer			0.0007	2.9621	--	--
Spiny dogfish	winter	0.0354	0.3736	0.0588	0.2908	0.0136	0.2936
	summer			0.0175	0.1216	0.0012	0.0398
Splitnose rockfish	winter	0.0008	0.2136	0.0067	0.0617	0.0002	0.0199
	summer			0.0071	0.1354	0.0003	0.0572
Starry flounder	winter	0.0008	0.0110	--	--	--	--
	summer			--	--	--	--
Unspecified skate	winter	0.0001	0.0027	0.0004	0.0080	0.0005	0.0148
	summer			0.0001	0.0011	0.0002	0.0077
Yellowmouth rockfish	winter	--	--	--	--	0.0000	NA
	summer			0.0003	NA	0.0000	NA
Yellowtail rockfish	winter	0.0096	0.2100	0.0001	0.0119	--	--
	summer			0.0000	0.0005	--	--
Non-groundfish species							
Dungeness crab	winter	0.1105	0.2074	0.0001	0.0103	0.0000	0.0278
	summer			0.0004	0.0165	0.0000	0.0169
Eulachon	winter	0.0000	0.0013	--	--	--	--
	summer			--	--	--	--
Other non-FMP flatfish	winter	0.0098	0.0799	0.0006	0.0087	0.0020	0.0076
	summer			0.0002	0.0025	0.0034	0.0065
Other non-FMP skate	winter	0.0042	0.0734	0.0043	0.0222	0.0050	0.0158
	summer			0.0047	0.0132	0.0061	0.0110
Other nongroundfish	winter	0.0185	0.0236	0.0336	0.0481	0.0274	0.0168
	summer			0.0113	0.0083	0.0386	0.0183
Tanner crab	winter	0.0000	NA	0.0009	0.0199	0.0319	0.0879
	summer			0.0012	0.0120	0.0325	0.0428

Table 2b. Discard ratios and standard error from observed trips south of 40°10' N latitude in the 2010 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. The 125-250 fm stratum was combined across seasons.

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	<i>Denominator = Retained groundfish (mt)</i>					
Bocaccio	winter	0.0246	0.6463	0.0103	0.6904	--	--
	summer	0.0105	0.4070			--	--
Canary rockfish	winter	--	--	--	--	--	--
	summer	0.0003	0.0209			--	--
Cowcod	winter	--	--	0.0010	0.2690	--	--
	summer	0.0002	0.0208			--	--
Darkblotched rockfish	winter	0.0001	0.0229	0.0006	0.0166	--	--
	summer	0.0003	0.0260			--	--
Widow rockfish	winter	--	--	0.0052	0.2781	--	--
	summer	0.0003	0.0225			0.0000	0.0071
Yelloweye rockfish	winter	--	--	0.0001	NA	--	--
	summer	--	--			--	--
Non-rebuilding species							
Arrowtooth flounder	winter	0.0009	0.1378	0.0236	0.2016	0.0010	0.1427
	summer	0.0368	0.4661			0.0011	0.0369
Bank rockfish	winter	--	--	0.0001	0.0140	--	--
	summer	--	--			--	--
Big skate	winter	0.0032	1.4036	0.0001	0.0180	--	--
	summer	0.0067	0.1218			--	--
Blackgill rockfish	winter	--	--	--	--	--	--
	summer	--	--			--	--
California skate	winter	0.0124	0.1911	--	--	--	--
	summer	0.0075	0.1202			--	--
Chilipepper rockfish	winter	0.0630	0.5433	0.0226	0.4520	--	--
	summer	0.0841	0.7711			--	--
Dover sole	winter	0.0021	0.0772	0.0613	0.2913	0.0075	0.0623
	summer	0.0057	0.0434			0.1058	0.3819
English sole	winter	0.0368	0.1486	0.0062	0.0420	--	--
	summer	0.0137	0.0488			--	--
Greenspotted rockfish	winter	0.0000	0.0138	0.0001	NA	--	--
	summer	0.0006	0.0217			--	--
Greenstriped rockfish	winter	0.0079	0.2273	0.0001	0.0199	--	--
	summer	0.0076	0.1030			--	--
Grenadiers	winter	--	--	0.0000	NA	0.0560	0.6849
	summer	--	--			0.0447	0.6603
Kelp greenling	winter	--	--	--	--	--	--
	summer	--	--			--	--
Lingcod	winter	0.0066	0.0819	0.0000	0.0025	--	--
	summer	0.0093	0.0611			0.0000	0.0006
Longnose skate	winter	0.0488	0.2294	0.0822	0.3347	0.0264	0.1689
	summer	0.1330	0.5031			0.0316	0.1021
Longspine thornyhead	winter	--	--	0.0009	0.0129	0.0179	0.0789
	summer	0.0001	0.0125			0.0264	0.0533
Mixed thornyheads	winter	--	--	--	--	0.0093	0.1380
	summer	--	--			--	--

Table 2b (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	<i>Denominator = Retained groundfish (mt)</i>					
Other flatfish	winter	0.1885	0.2817	0.0256	0.1316	0.0000	0.0005
	summer	0.0193	0.0425				
Other groundfish	winter	0.0367	0.3301	0.0567	0.3609	0.0051	0.0855
	summer	0.0307	0.2096				
Other nearshore rockfish	winter	--	--	--	--	--	--
	summer	--	--				
Other shelf rockfish	winter	0.0881	1.4622	0.0102	0.2276	--	--
	summer	0.0114	0.1639				
Other slope rockfish	winter	--	--	0.0017	0.0108	0.0003	0.0406
	summer	--	--				
Pacific cod	winter	--	--	--	--	--	--
	summer	--	--				
Pacific hake	winter	0.0458	0.3357	0.1024	0.5966	0.0147	1.4489
	summer	0.0096	0.1079				
Petrale sole	winter	0.0131	0.0754	0.0025	0.0196	--	--
	summer	0.0209	0.0679				
Sablefish (North of 36° N. lat.)	winter	0.0018	0.1078	0.0407	0.1667	0.0152	0.1756
	summer	0.0204	0.3818				
Sharpchin rockfish	winter	--	--	0.0010	0.2214	--	--
	summer	0.0000	NA				
Shortbelly rockfish	winter	0.0121	0.2808	0.0055	0.9624	--	--
	summer	0.0005	0.0324				
Shortspine thornyhead	winter	--	--	0.0030	0.0204	0.0003	0.0036
	summer	--	--				
Spiny dogfish	winter	0.0153	0.2011	0.0472	1.2743	0.0004	NA
	summer	0.0047	0.0493				
Splitnose rockfish	winter	0.0207	0.6352	0.1562	0.5918	0.0000	NA
	summer	0.0000	0.0019				
Unspecified skate	winter	0.0002	0.0231	0.0002	0.0295	--	--
	summer	--	--				
Yellowtail rockfish	winter	--	--	--	--	--	--
	summer	0.0001	0.0169				
Non-rebuilding species	Season						
Dungeness crab	winter	0.1823	0.9758	0.0226	0.2521	--	--
	summer	0.1767	1.3009				
Eulachon	winter	--	--	--	--	--	--
	summer	--	--				
Other non-FMP flatfish	winter	0.0004	0.0201	0.0065	0.2045	0.0106	0.0637
	summer	0.0006	0.0078				
Other non-FMP skate	winter	0.0112	0.1035	0.0141	0.0693	0.0167	0.0854
	summer	0.0026	0.0573				
Other nongroundfish	winter	0.0231	0.0473	0.0160	0.0297	0.0724	0.0573
	summer	0.0389	0.1119				
Tanner crab	winter	--	--	0.0025	0.1038	0.0828	0.2814
	summer	--	--				

Table 3. Landings (mt), estimated discard (mt), and fishing mortality estimate (mt) of groundfish species from non-hake, commercial limited entry groundfish bottom trawls in 2010. Discard ratios (Table 2) were multiplied by FMP groundfish landings (excluding Pacific hake) to generate estimated discard.

	North of 40°10' N Lat.			South of 40°10' N Lat.			Coastwide		
	Landed	Discard	Estimate	Landed	Discard	Estimate	Landed	Discard	Estimate
Rebuilding species									
Bocaccio	0.2	--	0.2	2.0	10.9	12.9	2.2	10.9	13.1
Canary rockfish	1.6	0.3	1.9	0.4	0.1	0.5	2.0	0.4	2.4
Cowcod (South of 40°10' N. lat.)	--	--	--	--	0.6	0.6	--	0.6	0.6
Darkblotched rockfish	145.9	130.1	276.0	11.0	0.4	11.4	156.8	130.5	287.3
Pacific ocean perch (North of 40°10' N. lat.)	70.0	60.1	130.1	--	--	--	70.0	60.1	130.1
Widow rockfish	3.0	18.5	21.4	1.1	2.9	4.1	4.1	21.4	25.5
Yelloweye rockfish	0.0	0.0	0.0	--	0.1	0.1	0.0	0.1	0.1
Non-rebuilding species									
Arrowtooth flounder	3209.1	725.8	3934.9	--	24.1	24.1	3209.1	749.9	3959.0
Bank rockfish (South of 40°10' N. lat.)	--	--	--	13.9	0.1	13.9	13.9	0.1	13.9
Big skate	0.1	29.7	29.8	1.1	2.1	3.2	1.2	31.8	33.0
Black rockfish (North of 46°16' N. lat.)	--	--	--	--	--	--	--	--	--
Black rockfish (South of 46°16' N. lat.)	0.3	--	0.3	--	--	--	0.3	--	0.3
Blackgill rockfish (South of 40°10' N. lat.)	--	--	--	61.4	--	61.4	61.4	--	61.4
Cabezon (Oregon)	0.0	--	0.0	--	--	--	0.0	--	0.0
California skate	0.1	--	0.1	--	3.2	3.2	0.1	3.2	3.2
Chilipepper rockfish	0.3	0.2	0.5	330.5	40.2	370.7	330.9	40.4	371.3
Dover sole	9286.4	377.1	9663.4	1032.7	146.6	1179.3	10319.1	523.7	10842.7
English sole	137.0	70.9	207.9	21.0	10.7	31.7	158.0	81.6	239.6
Greenspotted rockfish	0.0	0.0	0.1	0.0	0.2	0.2	0.1	0.2	0.3
Greenstriped rockfish	2.6	4.0	6.6	--	2.8	2.8	2.6	6.8	9.4
Grenadiers	75.7	110.7	186.4	31.7	81.2	112.9	107.4	191.9	299.3
Kelp greenling	--	0.0	0.0	--	--	--	--	0.0	0.0
Lingcod (North of 42° N. lat.)		15.0			--			15.0	
50% mortality*	49.8	7.5	57.3	--	--	--	49.8	7.5	57.3
Lingcod (South of 42° N. lat.)		0.1			3.1			3.2	
50% mortality*	1.9	0.1	2.0	21.1	1.5	22.6	23.0	1.6	24.6
Longnose skate	898.7	187.2	1085.9	47.3	132.7	180.1	946.0	319.9	1266.0
Longspine thornyhead (North of 34° 27' N. lat.)	1094.2	333.1	1427.2	229.2	38.6	267.8	1323.4	371.6	1695.0
Mixed thornyheads	--	20.6	20.6	4.9	6.0	10.9	4.9	26.6	31.5

* Mortality rates provided by the Groundfish Management Team (GMT).

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0 when a value is smaller than one decimal place.

Table 3 (continued).

	North of 40°10' N Lat.			South of 40°10' N Lat.			Coastwide		
	Landed	Discard	Estimate	Landed	Discard	Estimate	Landed	Discard	Estimate
Non-rebuilding species (cont.)									
Other flatfish	590.1	251.1	841.2	75.9	38.9	114.8	666.0	290.0	956.0
Other groundfish	0.6	85.7	86.3	1.1	48.6	49.7	1.7	134.2	135.9
Other nearshore rockfish	0.0	--	0.0	0.0	--	0.0	0.0	--	0.0
Other shelf rockfish	0.4	5.7	6.1	0.4	17.8	18.2	0.8	23.5	24.3
Other slope rockfish	118.7	113.3	232.0	4.8	2.0	6.8	123.5	115.3	238.8
Pacific cod (North of 43° N. lat.)	99.5	0.1	99.6	--	--	--	99.5	0.1	99.6
Pacific hake	365.8	310.4	676.2	--	82.2	82.2	365.8	392.5	758.3
Petrale sole	626.2	120.1	746.2	146.1	8.0	154.1	772.2	128.1	900.3
Redstripe rockfish (North of 40°10' N. lat.)	0.1	0.0	0.1	--	--	--	0.1	0.0	0.1
Sablefish (North of 36° N. lat.)		423.9			50.8			474.7	
50% mortality*	2188.1	211.9	2400.1	322.9	25.4	348.3	2511.1	237.3	2748.4
Sablefish (South of 36° N. lat.)		--			--			--	
50% mortality*	--	--	--	--	--	--	--	--	--
Sharpchin rockfish	0.3	8.2	8.5	--	0.6	0.6	0.3	8.8	9.1
Shortbelly rockfish	--	--	--	--	4.4	4.4	0.0	4.4	4.4
Shortspine thornyhead (North of 34°27' N. lat.)	956.6	75.0	1031.5	142.8	3.2	146.0	1099.4	78.1	1177.5
Silvergray rockfish (North of 40°10' N. lat.)	0.2	3.3	3.5	--	--	--	0.2	3.3	3.5
Spiny dogfish	54.9	430.6	485.5	5.3	29.2	34.6	60.2	459.8	520.1
Splitnose rockfish	3.6	56.4	59.9	47.6	89.1	136.7	51.2	145.5	196.6
Starry flounder	17.6	1.4	19.0	11.4	0.0	11.4	29.0	1.4	30.4
Unspecified skate	176.1	5.7	181.8	17.0	0.1	17.2	193.1	5.9	199.0
Yellowmouth rockfish (North of 40°10' N. lat.)	1.9	1.4	3.3	--	--	--	1.9	1.4	3.3
Yellowtail rockfish	13.7	16.5	30.2	0.1	0.0	0.1	13.8	16.5	30.3
Non-groundfish species									
California halibut	0.0	--	0.0	54.7	--	54.7	54.7	0.0	54.7
Dungeness crab	--	190.0	190.0	--	75.9	75.9	0.0	265.9	265.9
Eulachon	--	0.0	0.0	--	--	--	0.0	0.0	0.0
Other non-FMP flatfish	0.1	47.1	47.2	0.1	18.5	18.6	0.2	65.6	65.8
Other non-FMP skate	0.2	99.0	99.1	--	26.8	26.8	0.2	125.7	125.9
Other nongroundfish	4.7	533.2	537.9	12.2	103.7	115.9	16.9	636.9	653.8
Tanner crab	--	346.9	346.9	--	107.6	107.6	0.0	454.5	454.5

* Mortality rates provided by the Groundfish Management Team (GMT).

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0 when a value is smaller than one decimal place.

Table 4. Observed discard ratios with standard error and California halibut landings (mt) from the federal limited entry and open access participants in the state-licensed California halibut fishery in 2010 (only occurs south of 40°10' N Lat.). Ratios are computed as the observed discard weight divided by the observed weight of retained California halibut (adjusted to fish tickets).

SOUTH of 40°10' N Lat.	Limited Entry	Open Access
Expansion factor		
Fleet landings of California halibut (mt) (Based on fish tickets)	54.7	66.4
	Combined LE and OA*	
Number of observed vessels	8	
Number of observed trips	43	
Number of observed tows	152	
Observed discard ratios and standard error	Discard Ratio	SE
Rebuilding species		
Bocaccio	--	--
Canary rockfish	--	--
Cowcod	--	--
Darkblotched rockfish	--	--
Widow rockfish	--	--
Yelloweye rockfish	--	--
Non-rebuilding species		
Big skate	0.2021	0.8765
California scorpionfish (South of 34°27' N. lat.)	0.0028	0.0464
California skate	0.0995	1.1560
English sole	0.0329	0.1782
Lingcod	0.0081	0.2007
Longnose skate	0.0009	0.2603
Other flatfish	0.2124	0.2815
Other groundfish	0.0085	0.6294
Other nearshore rockfish	0.0000	0.0071
Petrale sole	0.0009	0.0508
Spiny dogfish	0.0241	1.0420
Starry flounder	0.0118	0.0775
Unspecified skate	0.0662	0.6057
Non-groundfish species		
California halibut	0.0628	0.1197
Dungeness crab	2.0693	6.3084
Other non-FMP flatfish	0.0422	0.2724
Other non-FMP skate	0.0000	NA
Other nongroundfish	0.8222	0.5571

* LE and OA observer data were combined before computing discard ratios to maintain an adequate sample size.

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0000 when a value is smaller than four decimal places.

Table 5. Landings (mt), estimated discard (mt), and fishing mortality estimate (mt) of groundfish species from the federal limited entry and open access participants in the state-licensed California halibut fishery in 2010. Discard ratios (Table 4) were multiplied by landings of California halibut to generate estimated discard. Because limited entry vessels participating in the California halibut fishery often land catch from this fishery at the same time as catch from bottom trawl tows targeting groundfish, it was not possible to split out groundfish landed weights for the limited entry bottom trawl and limited entry California halibut sectors. Joint landings for these two sectors are presented in Table 3.

SOUTH of 40°10' N Lat.	Limited Entry		Open Access		All CA Halibut Sectors			
	Landed	Discard	Landed	Discard	OA Landed	Discard	Fishing Mortality Estimate	
Rebuilding species								
Bocaccio		--	--	--	--	--	--	
Canary rockfish		--	--	--	--	--	--	
Cowcod		--	--	--	--	--	--	
Darkblotched rockfish		--	--	--	--	--	--	
Widow rockfish		--	--	--	--	--	--	
Yelloweye rockfish		--	--	--	--	--	--	
Non-rebuilding species								
Big skate		11.06	--	13.41	--	24.46	24.46	
California scorpionfish (South of 34°27' N. lat.)	<i>Included in Table 3 (LE Trawl)</i>	0.15	0.04	0.18	0.04	0.34	0.38	
California skate		5.45	--	6.60	--	12.05	12.05	
Dover sole		--	0.03	--	0.03	--	0.03	
English sole		1.80	0.05	2.19	0.05	3.99	4.04	
Lingcod (South of 42° N. lat.)		0.45	--	0.54	--	0.99	--	
50% mortality *		0.22	0.02	0.27	0.02	0.49	0.51	
Longnose skate		0.05	--	0.06	--	0.11	0.11	
Other flatfish		11.62	3.95	14.09	3.95	25.71	29.66	
Other groundfish		0.46	0.07	0.56	0.07	1.03	1.10	
Other nearshore rockfish		0.00	0.00	0.00	0.00	0.00	0.01	
Petrale sole		0.05	0.02	0.06	0.02	0.10	0.13	
Spiny dogfish		1.32	--	1.60	--	2.92	2.92	
Starry flounder		0.64	1.04	0.78	1.04	1.43	2.47	
Unspecified skate		3.63	0.73	4.40	0.73	8.02	8.75	
Non-groundfish species								
California halibut			3.44	66.35	4.17	66.35	7.61	73.96
Dungeness crab		113.25	--	137.30	--	250.54	250.54	
Other non-FMP flatfish		2.31	1.77	2.80	1.77	5.11	6.88	
Other non-FMP skate		0.00	--	0.00	--	0.01	0.01	
Other nongroundfish		45.00	2.71	54.56	2.71	99.55	102.26	

*The mortality rate for lingcod in the limited entry bottom trawl fishery is provided by the Groundfish Management Team.

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.00 when a value is smaller than two decimal places.

Table 6. Observed discard ratios with standard error and pink shrimp landings (mt) from the pink shrimp fishery north of 40° 10' N. latitude in 2010. Ratios are computed as the observed discard weight divided by the observed weight of retained pink shrimp (adjusted to fish tickets).

NORTH of 40°10' N Lat.	Pink Shrimp Fishery	
Expansion factor (Based on fish tickets)	20327.08	
Fleet landings of pink shrimp (mt)		
Number of observed vessels	51	
Number of observed trips	126	
Number of observed tows	1654	
Observed discard ratios and standard error	Discard Ratio	SE
Rebuilding species		
Bocaccio	0.00000	NA
Canary rockfish	0.00000	NA
Darkblotched rockfish	0.00059	0.00063
Pacific ocean perch	0.00000	0.00018
Widow rockfish	0.00000	0.01569
Yelloweye rockfish	0.00000	NA
Non-rebuilding species		
Arrowtooth flounder	0.00112	0.00146
Big skate	0.00000	0.00138
Chilipepper rockfish	0.00000	0.00022
Dover sole	0.00015	0.00056
English sole	0.00012	0.00165
Greenstriped rockfish	0.00008	0.00047
Lingcod (North of 42° N. lat.)	0.00000	0.00214
Lingcod (South of 42° N. lat.)	0.00000	0.00244
Longnose skate	0.00002	0.00087
Other flatfish	0.00243	0.00222
Other groundfish	0.00002	0.00069
Other shelf rockfish	0.00007	0.00067
Other slope rockfish	0.00001	0.00038
Pacific cod	0.00000	0.02532
Pacific hake	0.01962	0.02898
Petrale sole	0.00006	0.00100
Redstripe rockfish	0.00000	0.00009
Sablefish	0.00006	0.00954
Sharpchin rockfish	0.00000	0.00165
Shortbelly rockfish	0.00001	0.00038
Shortspine thornyhead	0.00001	0.00263
Spiny dogfish	0.00081	0.19065
Splitnose rockfish	0.00001	0.00034
Unspecified skate	0.00000	NA
Yellowmouth rockfish	0.00000	0.00013
Yellowtail rockfish	0.00001	0.00111
Non-groundfish species		
Dungeness crab	0.00004	0.00338
Eulachon	0.00093	0.00117
Other non-FMP flatfish	0.00567	0.00472
Other non-FMP skate	0.00000	0.00253
Other nongroundfish	0.00334	0.00087
Pink shrimp + unidentified shrimp	0.02242	0.03951

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.00000 when a value is smaller than five decimal places.

Table 7. Landings (mt), estimated discard (mt), and fishing mortality estimate (mt) of groundfish species from the pink shrimp fishery north of 40° 10' N. latitude in 2010. Discard ratios (Table 6) were multiplied by fleet landings of pink shrimp to generate estimated discard.

NORTH of 40°10' N Lat.	Pink Shrimp Fishery		
	Landed	Discard	Estimate
Rebuilding species			
Bocaccio	--	0.00	0.00
Canary rockfish	--	0.02	0.02
Darkblotched rockfish	--	12.07	12.07
Pacific ocean perch	--	0.06	0.06
Widow rockfish	--	0.07	0.07
Yelloweye rockfish	--	0.00	0.00
Non-rebuilding species			
Arrowtooth flounder	--	22.75	22.75
Big skate	--	0.01	0.01
Chilipepper rockfish	--	0.02	0.02
Dover sole	--	2.99	2.99
English sole	--	2.50	2.50
Greenstriped rockfish	--	1.69	1.69
Lingcod (North of 42° N. lat.)	--	0.10	0.10
Lingcod (South of 42° N. lat.)	--	0.01	0.01
Longnose skate	--	0.44	0.44
Other flatfish	--	49.37	49.37
Other groundfish	--	0.42	0.42
Other shelf rockfish	--	1.48	1.48
Other slope rockfish	--	0.14	0.14
Pacific cod	--	0.06	0.06
Pacific hake	--	398.86	398.86
Petrале sole	--	1.22	1.22
Redstripe rockfish	--	0.00	0.00
Sablefish	--	1.23	1.23
Sharpchin rockfish	--	0.02	0.02
Shortbelly rockfish	--	0.24	0.24
Shortspine thornyhead	--	0.17	0.17
Spiny dogfish	--	16.40	16.40
Splitnose rockfish	--	0.16	0.16
Unspecified skate	--	0.00	0.00
Yellowmouth rockfish	--	0.00	0.00
Yellowtail rockfish	--	0.22	0.22
Non-groundfish species			
Dungeness crab	--	0.80	0.80
Eulachon	--	18.92	18.92
Other non-FMP flatfish	--	115.22	115.22
Other non-FMP skate	--	0.06	0.06
Other nongroundfish	0.90	67.99	68.88
Pink shrimp + unidentified shrimp	20327.08	455.64	20782.71

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.00 when a value is smaller than two decimal places.

Table 8. Expansion factor and observed discard rate description by area and gear type for limited entry (LE) and open access (OA) non-nearshore fixed gear sectors used to expand discard estimates to the fleet level for each area-sector-gear stratum. The stratum estimated discard weights for all sectors were then summed for each area and then summed coast-wide.

Expansion Factor	Area	Sector	Observed Discard Ratios	
			Longline	Pot
Sablefish Landings	North of 40° 10' N Lat.	LE sablefish primary LE sablefish non-primary OA fixed gear	LE sablefish primary (North of 36°) LE sablefish non-endorsed OA fixed gear	LE sablefish primary (North of 36°) OA fixed gear OA fixed gear
	36° to 40° 10' N Lat.	LE sablefish primary LE sablefish non-primary OA fixed gear	LE sablefish primary (North of 36°) LE sablefish non-endorsed LE sablefish non-endorsed + OA fixed gear	LE sablefish primary (North of 36°) -- OA fixed gear
Groundfish Landings	South of 36° N Lat.	LE sablefish primary LE sablefish non-primary OA fixed gear	LE sablefish primary LE sablefish non-endorsed OA fixed gear	-- OA fixed gear

Table 9. Observed discard ratios with standard error and sablefish landings (mt) from the LE sablefish primary (tier endorsed) fixed gear fleet in 2010. Ratios are computed as the observed discard weight divided by the observed weight of retained sablefish (north of 36° N lat.) or FMP groundfish (south of 36° N lat.) (adjusted to fish tickets). Discard ratios were multiplied by fleet landings of sablefish north of 36° N latitude and fleet landings of FMP groundfish south of 36° N latitude to generate discard estimates for each gear type; combined with other fixed gear sectors in Table 12.

LE Sablefish Primary	North of 40°10' N Lat.		40°10' to 36° N Lat.		South of 36° N Lat.					
	Longline	Pot	Longline	Pot	Longline					
Expansion factor (Based on fish tickets)										
Fleet landings of sablefish (mt)	1106.9	446.6	174.1	56.7						
Fleet landings of groundfish (mt)					10.2					
	<i>Data combined across areas</i>				<i>Data combined across areas</i>					
Number of observed vessels	18	7	18	7	3					
Number of observed trips	138	43	138	43	4					
Number of observed sets	745	314	745	314	9					
Observed discard ratios and standard error	<i>Denominator = Retained sablefish (mt)</i>								<i>Denominator = Retained groundfish (mt)</i>	
	Discard Ratio	SE	Discard Ratio	SE	Discard Ratio	SE	Discard Ratio	SE	Discard Ratio	SE
Rebuilding species										
Bocaccio	--	--	--	--	--	--	--	--	--	--
Canary rockfish	0.0000	0.0129	--	--	0.0000	0.0129	--	--	--	--
Cowcod (South of 40°10' N. lat.)	--	--	--	--	--	--	--	--	--	--
Darkblotched rockfish	0.0001	0.0018	0.0001	0.0028	0.0001	0.0018	0.0001	0.0028	--	--
Pacific ocean perch (North of 40°10' N. lat.)	0.0001	0.0116	0.0000	0.0026	0.0001	0.0116	0.0000	0.0026	--	--
Widow rockfish	0.0000	0.0196	--	--	0.0000	0.0196	--	--	--	--
Yelloweye rockfish	0.0002	0.1327	--	--	0.0002	0.1327	--	--	--	--
Non-rebuilding species										
Arrowtooth flounder	0.0321	0.0821	0.0043	0.0473	0.0321	0.0821	0.0043	0.0473	--	--
Big skate	0.0009	0.2400	--	--	0.0009	0.2400	--	--	--	--
Blackgill rockfish (South of 40°10' N. lat.)	0.0000	0.0009	0.0002	0.2350	0.0000	0.0009	0.0002	0.2350	--	--
California skate	0.0002	0.6421	--	--	0.0002	0.6421	--	--	--	--
Dover sole	0.0020	0.0126	0.0029	0.0125	0.0020	0.0126	0.0029	0.0125	--	--
Greenstriped rockfish	0.0002	0.0156	--	--	0.0002	0.0156	--	--	--	--
Grenadiers	0.0119	0.3694	0.0010	0.0045	0.0119	0.3694	0.0010	0.0045	0.1210	0.4769
Lingcod (North of 42° N. lat.)	0.0015	0.0244	0.0074	0.1169	0.0015	0.0244	0.0074	0.1169	--	--
Lingcod (South of 42° N. lat.)	0.0007	0.2374	--	--	0.0007	0.2374	--	--	--	--
Longnose skate	0.0346	0.0633	0.0002	0.0837	0.0346	0.0633	0.0002	0.0837	0.0063	--
Longspine thornyhead (North of 34°27' N. lat.)	0.0000	0.0002	0.0000	0.0007	0.0000	0.0002	0.0000	0.0007	--	--
Longspine thornyhead (South of 34°27' N. lat.)	--	--	--	--	--	--	--	--	0.0137	0.0438
Mixed thornyheads	0.0000	0.0129	--	--	0.0000	0.0129	--	--	--	--
Other flatfish	--	--	0.0000	0.0064	--	--	0.0000	0.0064	--	--
Other groundfish	0.0016	0.0160	--	--	0.0016	0.0160	--	--	0.0046	--
Other shelf rockfish	0.0003	0.0047	0.0001	0.0045	0.0003	0.0047	0.0001	0.0045	--	--
Other slope rockfish	0.0285	0.0342	0.0077	0.0256	0.0285	0.0342	0.0077	0.0256	--	--
Pacific hake	0.0001	0.0051	--	--	0.0001	0.0051	--	--	--	--
Petrale sole	0.0000	0.0092	0.0000	0.0021	0.0000	0.0092	0.0000	0.0021	--	--
Redstripe rockfish (North of 40°10' N. lat.)	--	--	0.0000	0.0021	--	--	0.0000	0.0021	--	--
Sablefish	0.1784	0.0511	0.1954	0.1029	0.1784	0.0511	0.1954	0.1029	0.0992	0.2422

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0000 when a value is smaller than four decimal places.

Table 9 (continued).

LE Sablefish Primary	North of 40°10' N Lat.				40°10' to 36° N Lat.				South of 36° N Lat.	
	Longline		Pot		Longline		Pot		Longline	
Observed discard ratios and standard error	Discard Ratio	SE	Discard Ratio	SE	Discard Ratio	SE	Discard Ratio	SE	Discard Ratio	SE
Non-rebuilding species										
Shortspine thornyhead (North of 34°27' N. lat.)	0.0009	0.0022	0.0003	0.0080	0.0009	0.0022	0.0003	0.0080		
Shortspine thornyhead (South of 34°27' N. lat.)	--	--	--	--	--	--	--	--	0.1186	0.3174
Spiny dogfish	0.1618	0.4016	0.0308	0.5400	0.1618	0.4016	0.0308	0.5400	--	--
Splitnose rockfish (North of 40°10' N. lat.)	0.0000	0.0058	--	--	0.0000	0.0058	--	--	--	--
Starry flounder	0.0000	NA	--	--	0.0000	NA	--	--	--	--
Unspecified skate	0.0003	0.0061	0.0001	0.0492	0.0003	0.0061	0.0001	0.0492	--	--
Yellowmouth rockfish (North of 40°10' N. lat.)	0.0000	0.0243	--	--	0.0000	0.0243	--	--	--	--
Yellowtail rockfish	0.0000	0.0064	0.0000	NA	0.0000	0.0064	0.0000	NA	--	--
Non-groundfish species										
Dungeness crab	0.0000	0.0028	0.0021	0.0259	0.0000	0.0028	0.0021	0.0259	--	--
Other non-FMP flatfish	--	--	0.0000	0.0030	--	--	0.0000	0.0030	--	--
Other non-FMP skate	0.0010	0.0543	0.0000	NA	0.0010	0.0543	0.0000	NA	0.0201	0.1763
Other nongroundfish	0.1282	0.1498	0.0219	0.0220	0.1282	0.1498	0.0219	0.0220	0.0215	0.0976
Tanner crab	0.0002	0.0123	0.0031	0.0127	0.0002	0.0123	0.0031	0.0127	0.0024	0.0313

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0000 when a value is smaller than four decimal places.

Table 10. Observed discard ratios with standard error, sablefish landings (mt), and groundfish landings (mt) from the LE non-primary sablefish fixed gear fleet in 2010. Ratios are computed as the observed discard weight divided by the observed weight of retained sablefish (north of 36° N lat.) or FMP groundfish (south of 36° N lat.) (adjusted to fish tickets). Discard ratios were multiplied by fleet landings of sablefish north of 36° N latitude and fleet landings of FMP groundfish south of 36° N latitude to generate discard estimates for each gear type; combined with other fixed gear sectors in Table 12.

LE Non-Primary	North of 40°10' N Lat.		40°10' to 36° N Lat.		South of 36° N Lat.							
	Longline	Pot	Longline	Pot	Longline	Pot						
Expansion factor (Based on fish tickets)												
Fleet landings of sablefish (mt)	319.2	13.5	133.9	--								
Fleet landings of groundfish (mt)					490.7	--						
	<i>LE non-primary</i>	<i>OA pot data</i>	<i>LE non-primary</i>		<i>LE non-primary</i>							
Number of observed vessels	3	4	4	--	31	--						
Number of observed trips	16	7	10	--	200	--						
Number of observed sets	19	24	13	--	438	--						
Observed discard ratios and standard error	<i>Denominator = Retained sablefish (mt)</i>								<i>Denominator = Retained groundfish (mt)</i>			
	Discard Ratio	SE	Discard Ratio	SE	Discard Ratio	SE	Discard Ratio	SE	Discard Ratio	SE	Discard Ratio	SE
Rebuilding species												
Bocaccio	--	--	--	--	--	--	--	--	--	--	--	--
Canary rockfish	--	--	--	--	--	--	--	--	--	--	--	--
Cowcod (South of 40°10' N. lat.)	NA	NA	NA	NA	--	--	--	--	--	--	--	--
Darkblotched rockfish	0.0010	0.0135	--	--	--	--	--	--	--	--	--	--
Pacific ocean perch (North of 40°10' N. lat.)	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA
Widow rockfish	--	--	--	--	--	--	--	--	--	--	--	--
Yelloweye rockfish	--	--	--	--	--	--	--	--	--	--	--	--
Non-rebuilding species												
Arrowtooth flounder	0.0007	0.0063	0.0012	0.0000	--	--	--	--	0.0000	0.0000	--	--
Blackgill rockfish (South of 40°10' N. lat.)	NA	NA	NA	NA	--	--	--	--	0.0001	0.0034	--	--
California skate	--	--	--	--	--	--	--	--	--	--	--	--
Chilipepper rockfish (South of 40°10' N. lat.)	NA	NA	NA	NA	--	--	--	--	--	--	--	--
Dover sole	0.0002	0.0057	--	--	0.0096	0.0431	--	--	0.0072	0.0411	--	--
English sole	0.0001	0.0092	--	--	--	--	--	--	--	--	--	--
Greenspotted rockfish	--	--	--	--	--	--	--	--	--	--	--	--
Grenadiers	--	--	--	--	0.0135	0.1425	--	--	0.0089	0.1208	--	--
Lingcod (North of 42° N. lat.)	0.0013	0.0886	--	--	NA	NA	NA	NA	NA	NA	NA	NA
Lingcod (South of 42° N. lat.)	NA	NA	NA	NA	--	--	--	--	--	--	--	--
Longnose skate	0.0105	0.0467	--	--	0.0317	0.1849	--	--	0.0293	0.2302	--	--
Longspine thornyhead (North of 34°27' N. lat.)	--	--	--	--	0.0038	0.0288	--	--	0.0029	0.1048	--	--
Longspine thornyhead (South of 34°27' N. lat.)	NA	NA	NA	NA	NA	NA	NA	NA	0.0045	0.0026	NA	NA
Mixed thornyheads	--	--	--	--	--	--	--	--	0.0033	0.0862	--	--
Other flatfish	--	--	--	--	--	--	--	--	--	--	--	--
Other groundfish	0.0027	0.0387	--	--	0.0001	0.0000	--	--	0.0072	0.3937	--	--
Other nearshore rockfish	--	--	--	--	--	--	--	--	--	--	--	--
Other shelf rockfish	--	--	--	--	--	--	--	--	0.0000	0.0411	--	--
Other slope rockfish	0.0001	0.0004	0.0008	0.0000	--	--	--	--	--	--	--	--
Pacific hake	0.0006	0.0238	--	--	--	--	--	--	0.0000	0.0549	--	--
Petrals sole	0.0001	0.0000	--	--	--	--	--	--	--	--	--	--
Sablefish	0.1832	0.2621	0.0156	0.0160	0.0596	0.0983	--	--	0.0271	0.0671	--	--
Shortspine thornyhead (North of 34°27' N. lat.)	0.0011	0.0118	--	--	0.0061	0.0182	--	--	0.0041	0.2597	--	--
Shortspine thornyhead (South of 34°27' N. lat.)	NA	NA	NA	NA	NA	NA	NA	NA	0.0202	0.0106	NA	NA
Spiny dogfish	0.0351	0.2557	--	--	--	--	--	--	0.0015	0.0681	--	--
Splitnose rockfish (North of 40°10' N. lat.)	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA
Splitnose rockfish (South of 40°10' N. lat.)	NA	NA	NA	NA	--	--	--	--	--	--	--	--
Unspecified skate	--	--	--	--	--	--	--	--	0.0003	0.0474	--	--
Yellowtail rockfish	--	--	--	--	--	--	--	--	--	--	--	--
Non-groundfish species												
Dungeness crab	0.0007	0.0000	--	--	--	--	--	--	--	--	--	--
Other non-FMP skate	0.0009	0.0875	--	--	0.0003	0.0071	--	--	0.0076	0.1533	--	--
Other nongroundfish	0.0451	0.2948	0.0002	0.0000	0.0745	0.2385	--	--	0.1904	0.1775	--	--
Tanner crab	--	--	--	--	0.0040	0.0326	--	--	0.0004	0.0441	--	--

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0000 when a value is smaller than four decimal places.

Table 11. Observed discard ratios with standard error, sablefish landings (mt), and groundfish landings (mt) from the open access fixed gear fleet in 2010. Ratios are computed as the observed discard weight divided by the observed weight of retained sablefish (north of 36° N lat.) or FMP groundfish (south of 36° N lat.) (adjusted to fish tickets). Discard ratios were multiplied by fleet landings of sablefish north of 36° N latitude and fleet landings of FMP groundfish south of 36° N latitude to generate discard estimates for each gear type; combined with other fixed gear sectors in Table 12.

Open Access Fixed Gear	North of 40°10' N Lat.		40°10' to 36° N Lat.		South of 36° N Lat.	
	Hook-and-line	Pot	Hook-and-line	Pot	Hook-and-line	Pot
Expansion factor (Based on fish tickets)						
Fleet landings of sablefish (mt)	218.9	26.1	52.2	123.3	459.3	172.5
Fleet landings of groundfish (mt)						
Number of observed vessels	27	4	8	16	6	6
Number of observed trips	50	7	19	24	10	9
Number of observed sets	82	24	22	26	13	19
	<i>LE non-primary + OA</i>					
	Denominator = Retained sablefish (mt)					
	Denominator = Retained groundfish (mt)					
Observed discard ratios and standard error	Discard Ratio	SE	Discard Ratio	SE	Discard Ratio	SE
Rebuilding species						
Bocaccio	--	--	--	--	--	--
Canary rockfish	--	--	--	--	--	--
Cowcod (South of 40°10' N. lat.)	NA	NA	NA	NA	--	--
Darkblotched rockfish	0.0208	0.6166	--	--	--	--
Pacific ocean perch (North of 40°10' N. lat.)	--	--	--	--	NA	NA
Widow rockfish	--	--	--	--	NA	NA
Yelloweye rockfish	--	--	--	--	NA	NA
Non-rebuilding species						
Arrowtooth flounder	0.1273	0.3364	0.0012	--	--	--
Big skate	0.0002	--	--	--	--	--
Blackgill rockfish (South of 40°10' N. lat.)	NA	NA	NA	NA	0.0003	0.0083
Chillipepper rockfish	--	--	--	--	0.0022	0.0058
Dover sole	0.0016	0.0157	--	--	0.0011	0.0046
Grenadiers	--	--	--	--	0.0004	0.0100
Lingcod (North of 42° N. lat.)	0.0003	0.0627	--	--	NA	NA
Lingcod (South of 42° N. lat.)	NA	NA	NA	NA	0.0079	0.1039
Longnose skate	0.0181	0.0708	--	--	0.0316	0.1376
Longspine thornyhead (North of 34°27' N. lat.)	--	--	--	--	0.0064	0.0388
Longspine thornyhead (South of 34°27' N. lat.)	NA	NA	NA	NA	NA	NA
Mixed thornyheads	0.0000	0.0075	--	--	--	--
Other groundfish	0.0010	0.0198	--	--	0.0003	0.0101
Other nearshore rockfish	--	--	--	--	--	--
Other shelf rockfish	--	--	--	--	--	--
Other slope rockfish	0.0056	0.0091	0.0008	--	--	--
Pacific hake	0.0010	0.0230	--	--	0.0002	0.0024
Petrale sole	--	--	--	--	--	--
Sablefish	0.1949	0.1383	0.0156	0.0160	0.0675	0.0810
Sharpchin rockfish	--	--	--	--	0.3646	0.2428
Shortspine thornyhead (North of 34°27' N. lat.)	0.0080	0.0540	--	--	--	--
Shortspine thornyhead (South of 34°27' N. lat.)	NA	NA	NA	NA	0.0668	0.2873
Spiny dogfish	0.0423	0.1962	--	--	0.0005	0.0139
Splitnose rockfish (North of 40°10' N. lat.)	--	--	--	--	0.0001	0.0015
Splitnose rockfish (South of 40°10' N. lat.)	--	--	--	--	--	--
Unspecified skate	0.0003	0.0376	--	--	--	--
Yellowtail rockfish	0.0002	--	--	--	--	--
Non-groundfish species						
Dungeness crab	--	--	--	--	--	--
Other non-FMP skate	0.0001	--	--	--	0.0009	0.0099
Other nongroundfish	0.1074	0.9702	0.0002	--	0.0715	0.1960
Tanner crab	--	--	--	--	0.0279	0.5204
					0.0049	0.0252
					0.0047	0.0317
					0.1180	0.3741
					0.0013	0.0139

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0000 when a value is smaller than four decimal places.

Table 12. Landings (mt), estimated discard (mt), and fishing mortality estimate (mt) of groundfish species in non-nearshore fixed gear sectors by area during 2010. Discard ratios were multiplied by fleet landings of sablefish north of 36° N latitude and fleet landings of FMP groundfish south of 36° N latitude to generate estimated discard (Tables 9-11: LE sablefish primary, LE non-primary, OA).

	North of 40°10' N Lat.			40°10' to 36° N Lat.			South of 36° N Lat.			Coastwide
	Landed	Discard	Estimate	Landed	Discard	Estimate	Landed	Discard	Estimate	Estimate
Rebuilding species										
Bocaccio	0.2	--	0.2	0.4	--	0.4	0.5	--	0.5	1.1
Canary rockfish	--	0.0	0.0	--	0.0	0.0	--	--	--	0.0
Cowcod (South of 40°10' N. lat.)	NA	NA	NA	--	--	--	--	--	--	0.0
Darkblotched rockfish	11.0	5.0	16.1	0.0	0.0	0.1	--	--	--	16.1
Pacific ocean perch (North of 40°10' N. lat.)	3.6	0.1	3.8	NA	NA	NA	NA	NA	NA	3.8
Widow rockfish	0.0	0.0	0.1	0.0	0.0	0.0	0.0	--	0.0	0.1
Yelloweye rockfish	0.1	0.2	0.3	--	0.0	0.0	--	--	--	0.3
Non-rebuilding species										
Arrowtooth flounder	3.8	65.6	69.3	--	5.8	5.8	0.0	0.0	0.0	75.2
Bank rockfish (South of 40°10' N. lat.)	NA	NA	NA	0.0	--	0.0	0.1	--	0.1	0.1
Big skate	0.0	1.1	1.1	--	0.2	0.2	--	0.1	0.1	1.3
Blackgill rockfish (South of 40°10' N. lat.)	NA	NA	NA	4.4	0.3	4.7	79.1	0.3	79.5	84.2
California skate	0.0	0.2	0.2	--	0.0	0.0	--	--	--	0.3
Chilipepper rockfish	0.0	--	0.0	0.1	--	0.1	0.1	--	0.1	0.2
Dover sole	3.2	3.9	7.2	0.2	2.5	2.7	0.3	4.1	4.4	14.2
English sole	0.0	0.0	0.0	--	--	--	--	--	--	0.0
Greenspotted rockfish	0.0	--	0.0	0.0	--	0.0	0.8	--	0.8	0.8
Greenstriped rockfish	0.0	0.2	0.2	--	0.0	0.0	0.0	--	0.0	0.3
Grenadiers	0.0	13.6	13.6	28.3	4.5	32.8	1.3	17.0	18.3	64.6
Lingcod (North of 42° N. lat.)	17.4	5.4	22.8	--	--	--	--	--	--	22.8
Lingcod (South of 42° N. lat.)	2.7	0.8	3.5	0.9	1.1	2.0	0.7	--	0.7	6.2
Longnose skate	23.8	45.7	69.5	1.0	11.9	12.9	1.3	19.5	20.8	103.2
Longspine thornyhead (North of 34°27' N. lat.)	1.9	0.0	1.9	2.1	0.8	3.0	1.4	4.3	5.7	10.6
Longspine thornyhead (South of 34°27' N. lat.)	--	--	--	--	--	--	22.1	2.3	24.4	24.4
Mixed thornyheads	--	0.0	0.0	--	0.0	0.0	3.9	2.2	6.1	6.1
Other flatfish	0.0	0.0	0.0	0.1	0.0	0.1	2.5	--	2.5	2.6
Other groundfish	0.0	2.8	2.8	0.6	0.3	0.9	0.3	3.9	4.2	7.9
Other shelf rockfish	0.6	0.3	1.0	0.9	0.1	0.9	4.7	0.0	4.7	6.6
Other slope rockfish	80.9	36.2	117.1	2.0	5.4	7.4	1.0	0.1	1.1	125.6

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0 when a value is smaller than one decimal.

Table 12 (continued).

	North of 40°10' N Lat.			40°10' to 36° N Lat.			South of 36° N Lat.			Coastwide
	Landed	Discard	Estimate	Landed	Discard	Estimate	Landed	Discard	Estimate	Estimate
Non-rebuilding species (cont.)										
Pacific cod	2.9	--	2.9	--	--	--	--	--	--	2.9
Pacific hake	--	0.6	0.6	--	0.0	0.0	0.0	0.0	0.0	0.6
Petrale sole	0.1	0.1	0.2	0.0	0.0	0.0	0.1	--	0.1	0.4
Redstripe rockfish (North of 40°10' N. lat.)	0.2	0.0	0.2	NA	NA	NA	NA	NA	NA	0.2
Sablefish		386.5			98.6			59.7		
20% mortality *	2131.3	77.3	2208.6	540.5	19.7	560.2	834.9	11.9	846.9	3615.7
Sharpchin rockfish	0.1	--	0.1	--	--	--	--	--	--	0.1
Shortspine thornyhead (North of 34°27' N. lat.)	16.7	3.2	19.9	12.3	2.2	14.5	16.6	32.7	49.3	83.7
Shortspine thornyhead (South of 34°27' N. lat.)	NA	NA	NA	NA	NA	NA	160.6	11.2	171.8	171.8
Silvergray rockfish (North of 40°10' N. lat.)	0.1	0.0	0.1	NA	NA	NA	NA	NA	NA	0.1
Spiny dogfish	9.8	213.3	223.1	0.0	29.9	29.9	0.0	1.0	1.0	254.1
Splitnose rockfish	0.3	0.0	0.3	0.0	0.0	0.0	0.0	0.1	0.1	0.4
Starry flounder	--	0.0	0.0	--	0.0	0.0	0.0	--	0.0	0.0
Unspecified skate	17.3	0.4	17.7	0.1	0.1	0.1	0.0	0.2	0.2	18.0
Yellowmouth rockfish (North of 40°10' N. lat.)	1.0	0.0	1.0	NA	NA	NA	NA	NA	NA	1.0
Yellowtail rockfish	0.5	0.1	0.5	0.3	0.0	0.3	0.1	--	0.1	1.0
Non-groundfish species										
California halibut	--	--	--	0.1	--	0.1	0.1	--	0.1	0.2
Dungeness crab	0.5	1.2	1.7	1.2	0.1	1.3	--	--	--	3.0
Other non-FMP flatfish	--	0.0	0.0	--	0.0	0.0	--	--	--	0.0
Other non-FMP skate	--	1.4	1.4	--	0.3	0.3	--	4.4	4.4	6.0
Other nongroundfish	3.3	189.6	192.9	1.0	40.7	41.7	5.5	116.2	121.7	356.4
Tanner crab	--	1.6	1.6	0.2	2.2	2.4	0.0	2.6	2.6	6.6

* Mortality rate provided by the Groundfish Management Team (GMT).

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0 when a value is smaller than one decimal place.

Table 13. Commercial landings of nearshore species (mt) in Oregon and California during 2010, partitioned by depth interval and groundfish management area based on observed catch from 2003 to 2010.

	Observed landings (mt) 2003-2010	2010 Fleet landings (mt)	Percentage of observed catch by depth (fathoms) 2003-2010			2010 Fleet landings reallocated by depth (fathoms)		
			0 - 10	11 - 20	> 20	0 - 10	11 - 20	> 20
NORTH of 40° 10' N Lat.								
Nearshore species - commercial								
Black rockfish (South of 46°16' N. lat.)	99.3	150.2	46.6%	51.4%	2.1%	70.0	77.1	3.1
Blue rockfish	11.3	7.7	24.0%	67.0%	9.0%	1.9	5.2	0.7
Cabazon (Oregon)	13.6	23.5	29.8%	67.0%	3.2%	7.0	15.7	0.8
Cabazon (California)	1.3	1.8	45.4%	41.2%	13.3%	0.8	0.7	0.2
Kelp greenling	9.2	18.5	50.9%	47.4%	1.7%	9.4	8.8	0.3
Lingcod (North of 42° N. lat.)	12.9	20.2	32.6%	62.6%	4.8%	6.6	12.7	1.0
Lingcod (South of 42° N. lat.)	4.2	4.3	30.0%	48.9%	21.1%	1.3	2.1	0.9
Other minor nearshore rockfish	9.4	8.2	25.9%	59.0%	15.1%	2.1	4.9	1.2
Total:						99.1	127.2	8.2
SOUTH of 40° 10' N Lat.								
Nearshore species - commercial								
Black rockfish	0.8	1.5	46.7%	48.1%	5.2%	0.7	0.7	0.1
Blue rockfish	0.8	1.1	52.1%	40.9%	7.1%	0.6	0.5	0.1
Cabazon (California)	5.1	21.1	94.5%	4.1%	1.4%	19.9	0.9	0.3
California scorpionfish (South of 34°27' N. lat.)	0.4	3.0	4.0%	1.3%	94.8%	0.1	0.0	2.8
California sheephead	8.4	30.1	73.6%	25.3%	1.1%	22.1	7.6	0.3
Deeper nearshore rockfish	6.5	31.3	28.4%	58.3%	13.2%	8.9	18.2	4.1
Gopher rockfish	3.3	27.2	56.0%	35.3%	8.7%	15.2	9.6	2.4
Kelp greenling	0.4	1.4	88.6%	8.5%	2.9%	1.3	0.1	0.0
Lingcod	3.8	14.0	49.3%	40.6%	10.0%	6.9	5.7	1.4
Shallow nearshore rockfish	2.2	26.6	84.8%	11.1%	4.1%	22.6	2.9	1.1
Total:						98.3	46.3	12.7

Table 14. Observed discard ratios with standard error and nearshore species fleet landings (mt) from the commercial nearshore fixed gear fishery in 2010 by groundfish management area and depth (fathoms).

	North of 40° 10' N lat.			South of 40° 10' N lat.							
	0 - 10 fm	11 - 20 fm	> 20 fm	0 - 10 fm	11 - 20 fm	> 20 fm					
Expansion factor (Based on fish tickets)											
Fleet landings of nearshore species (mt)	99.1	127.2	8.2	98.3	46.3	12.7					
Number of observed vessels	45	Data combined across depths *		10	8	5					
Number of observed trips	92	40		19	19	21					
Number of observed sets	105	116		31	25	25					
		141									
	Denominator = Retained nearshore species (mt)										
Observed discard ratios and standard error	Discard Ratio SE		Discard Ratio SE		Discard Ratio SE		Discard Ratio SE		Discard Ratio SE		
Rebuilding species											
Bocaccio	--	--	--	--	--	--	--	--	--	--	
Canary rockfish	0.0034	0.0245	0.0080	0.0330	--	--	0.0897	1.1773	0.2356	0.9243	
Cowcod (South of 40°10' N. lat.)	NA	NA	NA	NA	--	--	--	--	--	--	
Darkblotched rockfish	--	--	--	--	--	--	--	--	--	--	
Pacific ocean perch (North of 40°10' N. lat.)	--	--	--	--	NA	NA	NA	NA	NA	NA	
Widow rockfish	--	--	--	--	--	--	--	--	--	--	
Yelloweye rockfish	0.0002	0.0652	0.0006	0.0860	--	--	0.0008	NA	0.0051	0.1639	
Non-rebuilding species											
Black rockfish (South of 46°16' N. lat.) **	0.0324	0.0286	0.0142	0.0190	0.0079	0.1780	0.0152	0.4047	--	--	
Blue rockfish **	0.0218	0.0359	0.0349	0.0470	0.0062	0.0743	0.0244	0.2103	0.1028	0.4822	
Cabazon (Oregon) **	0.0081	0.0223	0.0088	0.0879	--	--	--	--	--	--	
Cabazon (California) **	--	--	0.0003	0.0304	0.0558	0.2164	0.0019	0.1014	0.0002	NA	
California scorpionfish (South of 34°27' N. lat.) **	NA	NA	NA	NA	0.0002	0.0133	--	--	0.0427	0.4525	
California skate	--	--	--	--	--	--	--	--	0.0015	NA	
Deeper nearshore rockfish **	--	--	--	--	0.0111	0.0426	0.0097	0.0187	0.0110	0.0146	
Gopher rockfish (South of 40°10' N. lat.) **	NA	NA	NA	NA	0.0176	0.0532	0.0385	0.1029	0.0453	0.1437	
Greenstriped rockfish	--	--	--	--	--	--	--	--	--	--	
Kelp greenling **	0.0203	0.0206	0.0128	0.0170	0.0167	0.1711	0.0184	0.1103	0.0149	0.0867	
Lingcod (North of 42° N. lat.) **	0.0753	0.2033	0.0804	0.0258	NA	NA	NA	NA	NA	NA	
Lingcod (South of 42° N. lat.) **	0.0016	0.1274	0.0008	0.1056	0.0341	0.0983	0.0708	0.1782	0.1095	0.5163	
Other flatfish	0.0000	NA	--	--	0.0004	0.0200	0.0067	0.1605	0.0017	0.0357	
Other groundfish	--	--	0.0001	NA	--	--	0.0123	0.2332	0.0011	NA	
Other minor nearshore rockfish **	0.0020	0.0049	0.0017	0.0047	--	--	--	--	--	--	
Other shelf rockfish	--	--	0.0001	0.0036	--	--	0.0004	0.0038	0.0187	0.0542	
Petrale sole	--	--	--	--	--	--	0.0031	0.0864	--	--	
Shallow nearshore rockfish **	--	--	--	--	0.0278	0.0655	0.0321	0.1456	0.0583	0.1597	
Spiny dogfish	--	--	--	--	0.0048	NA	--	--	0.0261	0.4992	
Yellowtail rockfish	0.0016	0.0172	0.0043	0.0246	--	--	0.0013	0.0594	0.0063	0.0455	
Non-groundfish species											
Buffalo sculpin **	0.0008	0.0388	0.0010	0.2495	0.0005	NA	0.0065	0.1727	--	--	
California halibut	--	--	--	--	--	--	--	--	--	--	
California sheephead **	--	--	--	--	0.0323	0.5254	--	--	--	--	
Dungeness crab	0.0002	NA	0.0002	NA	--	--	0.0040	0.3488	--	--	
Other greenling **	--	--	--	--	--	--	--	--	--	--	
Other nongroundfish	0.0064	0.0487	0.0083	0.0417	0.0990	0.2359	0.0183	0.0673	0.0204	0.1175	
Red Irish lord **	0.0007	0.1667	0.0002	0.0115	--	--	--	--	--	--	

* Observer data were combined across the 11-20 and >20 fathom depth intervals North of 40° 10' N lat. before computing discard ratios to maintain an adequate sample size.

** Included in nearshore species denominator for discard ratios.

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0000 when a value is smaller than four decimal places.

Table 15a. Gross estimated discard (mt), discard mortality rates (provided by the Groundfish Management Team), estimated discard mortality (mt), fleet landings (mt), and fishing mortality estimates (mt) for the 2010 commercial nearshore fixed gear fishery north of 40° 10' N latitude.

Nearshore North of 40° 10' N lat.	Gross estimated discard (mt) by depth (fm)			Discard mortality rate * by depth (fm)			Estimated discard mortality (mt) by depth (fm)			Estimated discard mortality (mt)	Fleet Landings (mt)	Estimated fishing mortality (mt)
	0-10	11-20	> 20	0-10	11-20	> 20	0-10	11-20	> 20			
Rebuilding species												
Bocaccio	--	--	--	10%	70%	100%	--	--	--	--	--	--
Canary rockfish	0.34	1.02	0.07	10%	55%	100%	0.03	0.56	0.07	0.66	--	0.66
Darkblotched rockfish	--	--	--	--	--	--	--	--	--	--	0.00	0.00
Pacific ocean perch	--	--	--	--	--	--	--	--	--	--	--	--
Widow rockfish	--	--	--	50%	90%	100%	--	--	--	--	0.02	0.02
Yelloweye rockfish	0.02	0.08	0.00	10%	50%	100%	0.00	0.04	0.00	0.04	--	0.04
Non-rebuilding species												
Arrowtooth flounder	--	--	--	--	--	--	--	--	--	--	0.00	0.00
Black rockfish (South of 46° 16' N. lat.)	3.21	1.80	0.12	10%	40%	90%	0.32	0.72	0.10	1.15	150.21	151.35
Blue rockfish	2.16	4.43	0.29	10%	60%	100%	0.22	2.66	0.29	3.16	7.74	10.90
Cabazon (Oregon)	0.80	1.11	0.07	7%	7%	7%	0.06	0.08	0.01	0.14	23.47	23.61
Cabazon (California)	--	0.04	0.00	7%	7%	7%	--	0.00	0.00	0.00	1.77	1.77
Dover sole	--	--	--	7%	7%	7%	--	--	--	--	0.00	0.00
Kelp greenling	2.01	1.63	0.11	7%	7%	7%	0.14	0.11	0.01	0.26	18.52	18.78
Lingcod (North of 42° N. lat.)	7.46	10.23	0.66	7%	7%	7%	0.52	0.72	0.05	1.28	20.24	21.53
Lingcod (South of 42° N. lat.)	0.16	0.10	0.01	7%	7%	7%	0.01	0.01	0.00	0.02	4.27	4.29
Longnose skate	--	--	--	7%	7%	7%	--	--	--	--	0.04	0.04
Other flatfish	0.00	--	--	7%	7%	7%	0.00	--	--	0.00	0.00	0.00
Other groundfish	--	0.01	0.00	--	--	--	--	0.01	0.00	0.01	0.01	0.02
Other minor nearshore rockfish	0.19	0.22	0.01	10%	40%	100%	0.02	0.09	0.01	0.12	8.23	8.35
Other shelf rockfish	--	0.01	0.00	--	--	--	--	0.01	0.00	0.01	2.46	2.47
Other slope rockfish	--	--	--	--	--	--	--	--	--	--	0.00	0.00

* Discard mortality rates provided by the Groundfish Management Team (GMT).

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.00 when a value is smaller than two decimal places.

Table 15a (continued).

Nearshore North of 40° 10' N lat.	Gross estimated discard (mt) by depth (fm)			Discard mortality rate * by depth (fm)			Estimated discard mortality (mt) by depth (fm)			Estimated discard mortality (mt)	Fleet Landings (mt)	Estimated fishing mortality (mt)
	0-10	11-20	> 20	0-10	11-20	> 20	0-10	11-20	> 20			
Non-rebuilding species (cont.)												
Sablefish	--	--	--	--	--	--	--	--	--	--	0.54	0.54
Silvergrey rockfish	--	--	--	--	--	--	--	--	--	--	0.01	0.01
Spiny dogfish	--	--	--	7%	7%	7%	--	--	--	--	0.00	0.00
Splitnose rockfish	--	--	--	--	--	--	--	--	--	--	0.00	0.00
Unspecified skate	--	--	--	7%	7%	7%	--	--	--	--	0.15	0.15
Yellowtail rockfish	0.16	0.54	0.03	10%	30%	75%	0.02	0.16	0.03	0.20	0.73	0.93
Non-groundfish species												
Buffalo sculpin	0.08	0.13	0.01	--	--	--	0.08	0.13	0.01	0.22	--	0.22
Dungeness crab	0.02	0.02	0.00	--	--	--	0.02	0.02	0.00	0.05	1.40	1.45
Other greenling	--	--	--	7%	7%	7%	--	--	--	--	--	0.00
Other nongroundfish	0.63	1.06	0.07	--	--	--	0.63	1.06	0.07	1.76	0.13	1.89
Red Irish lord	0.07	0.02	0.00	--	--	--	0.07	0.02	0.00	0.09	--	0.09

* Discard mortality rates provided by the Groundfish Management Team (GMT).

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.00 when a value is smaller than two decimal places.

Table 15b. Gross estimated discard (mt), discard mortality rates (provided by the Groundfish Management Team), estimated discard mortality (mt), fleet landings (mt), and fishing mortality estimates (mt) for the 2010 commercial nearshore fixed gear fishery south of 40° 10' N latitude.

Nearshore South of 40° 10' N lat	Gross estimated discard (mt) by depth (fm)			Discard mortality rate * by depth (fm)			Estimated discard mortality (mt) by depth (fm)			Estimated discard mortality (mt)	Fleet Landings (mt)	Estimated fishing mortality (mt)
	0-10	11-20	> 20	0-10	11-20	> 20	0-10	11-20	> 20			
Rebuilding species												
Bocaccio	--	--	--	10%	70%	100%	--	--	--	--	0.52	0.52
Canary rockfish	0.00	4.15	2.98	10%	55%	100%	0.00	2.28	2.98	5.26	0.00	5.26
Cowcod (South of 40°10' N. lat.)	--	--	--	--	--	--	--	--	--	--	--	--
Darkblotched rockfish	--	--	--	--	--	--	--	--	--	--	0.07	0.07
Widow rockfish	--	--	--	50%	90%	100%	--	--	--	--	0.03	0.03
Yelloweye rockfish	0.00	0.04	0.07	10%	50%	100%	0.00	0.02	0.07	0.08	0.00	0.08
Non-rebuilding species												
Arrowtooth flounder	--	--	--	--	--	--	--	--	--	--	0.00	0.00
Bank rockfish (South of 40°10' N. lat.)	--	--	--	--	--	--	--	--	--	--	0.02	0.02
Black rockfish (South of 46°16' N. lat.)	0.77	0.70	--	10%	40%	90%	0.08	0.28	--	0.36	1.51	1.87
Blackgill rockfish (South of 40°10' N. lat.)	--	--	--	--	--	--	--	--	--	--	0.48	0.48
Blue rockfish	0.61	1.13	1.30	10%	60%	100%	0.06	0.68	1.30	2.04	1.10	3.14
Cabazon (California)	5.48	0.09	0.00	7%	7%	7%	0.38	0.01	0.00	0.39	21.10	21.49
California scorpionfish (South of 34°27' N. lat.)	0.02	--	0.54	7%	7%	7%	0.00	--	0.04	0.04	2.99	3.03
California skate	--	--	0.02	7%	7%	7%	--	--	0.00	0.00	--	0.00
Chilipepper rockfish	--	--	--	--	--	--	--	--	--	--	0.05	0.05
Deeper nearshore rockfish	1.09	0.45	0.14	10%	40%	90%	0.11	0.18	0.12	0.41	31.27	31.68
Dover sole	--	--	--	--	--	--	--	--	--	--	0.00	0.00
Gopher rockfish (South of 40°10' N. lat.)	1.73	1.78	0.57	10%	45%	100%	0.17	0.80	0.57	1.55	27.20	28.75
Greenspotted rockfish	--	--	--	--	--	--	--	--	--	--	0.01	0.01
Grenadiers	--	--	--	--	--	--	--	--	--	--	0.10	0.10
Kelp greenling	1.64	0.85	0.19	7%	7%	7%	0.11	0.06	0.01	0.19	1.42	1.61
Lingcod	3.35	3.28	1.39	7%	7%	7%	0.23	0.23	0.10	0.56	13.97	14.53
Longspine thornyhead (South of 34°27' N. lat.)	--	--	--	--	--	--	--	--	--	--	0.01	0.01
Other flatfish	0.04	0.31	0.02	7%	7%	7%	0.00	0.02	0.00	0.03	1.01	1.04
Other groundfish	--	0.57	0.01	--	--	--	--	0.57	0.01	0.58	0.88	1.46
Other shelf rockfish	--	0.02	0.24	--	--	--	--	0.02	0.24	0.25	6.85	7.11
Other slope rockfish	--	--	--	--	--	--	--	--	--	--	0.01	0.01
Petrale sole	--	0.14	--	7%	7%	7%	--	0.01	--	0.01	--	0.01

* Discard mortality rates provided by the Groundfish Management Team (GMT).

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.00 when a value is smaller than two decimal places.

Table 15b (continued).

Nearshore South of 40° 10' N lat	Gross estimated discard (mt) by depth (fm)			Discard mortality rate * by depth (fm)			Estimated discard mortality (mt) by depth (fm)			Estimated discard mortality (mt)	Fleet Landings (mt)	Estimated fishing mortality (mt)
	0-10	11-20	> 20	0-10	11-20	> 20	0-10	11-20	> 20			
Non-rebuilding species (cont.)												
Sablefish (North of 36° N. lat.)	--	--	--	--	--	--	--	--	--	--	1.78	1.78
Sablefish (South of 36° N. lat.)	--	--	--	--	--	--	--	--	--	--	7.65	7.65
Shallow nearshore rockfish	2.74	1.48	0.74	10%	45%	100%	0.27	0.67	0.74	1.68	26.64	28.32
Shortspine thornyhead (North of 34°27' N. lat.)	--	--	--	--	--	--	--	--	--	--	0.16	0.16
Shortspine thornyhead (South of 34°27' N. lat.)	--	--	--	--	--	--	--	--	--	--	0.10	0.10
Spiny dogfish	0.48	0.00	0.33	7%	7%	7%	0.03	0.00	0.02	0.06	0.04	0.09
Starry flounder	--	--	--	--	--	--	--	--	--	--	0.12	0.12
Unspecified skate	--	--	--	7%	7%	7%	--	--	--	--	0.00	0.00
Yellowtail rockfish	--	0.06	0.08	10%	30%	75%	--	0.02	0.06	0.08	0.15	0.23
Non-groundfish species												
Buffalo sculpin	0.05	0.30	--	--	--	--	0.05	0.30	--	0.35	--	0.35
California halibut	--	--	--	--	--	--	--	--	--	--	1.77	1.77
California sheephead	3.18	--	--	--	--	--	3.18	--	--	3.18	30.07	33.25
Dungeness crab	--	0.19	--	--	--	--	--	0.19	--	0.19	1.32	1.50
Other greenling	--	--	--	--	--	--	--	--	--	--	0.04	0.04
Other non-FMP flatfish	--	--	--	--	--	--	--	--	--	--	0.02	0.02
Other nongroundfish	9.74	0.85	0.26	--	--	--	9.74	0.85	0.26	10.84	35.34	46.18
Tanner crab	--	--	--	--	--	--	--	--	--	--	0.00	0.00

* Discard mortality rates provided by the Groundfish Management Team (GMT).

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.00 when a value is smaller than two decimal places.

Table 16. Landings (mt), estimated discard (mt), and fishing mortality estimates (mt) of groundfish species in the 2010 groundfish fisheries by sector.

	LE bottom trawl			California halibut			Pink shrimp			Non-nearshore fixed gear			Nearshore fixed gear		
	Landed	Discard	Estimate	Landed	Discard	Estimate	Landed	Discard	Estimate	Landed	Discard	Estimate	Landed	Discard	Estimate
Rebuilding species															
Bocaccio (South of 40°10' N. lat.)	2.0	10.9	12.9	--	--	--	--	--	--	0.9	--	0.9	0.5	--	0.5
Canary rockfish	2.0	0.4	2.4	--	--	--	--	0.0	0.0	--	0.0	0.0	0.0	5.9	5.9
Cowcod (South of 40°10' N. lat.)	--	0.6	0.6	--	--	--	--	--	--	--	--	--	--	--	--
Darkblotched rockfish	156.8	130.5	287.3	--	--	--	--	12.1	12.1	11.1	5.1	16.1	0.1	--	0.1
Pacific ocean perch (North of 40°10' N. lat.)	70.0	60.1	130.1	--	--	--	--	0.1	0.1	3.6	0.1	3.8	--	--	--
Widow rockfish	4.1	21.4	25.5	--	--	--	--	0.1	0.1	0.1	0.0	0.1	0.1	--	0.1
Yelloweye rockfish	0.0	0.1	0.1	--	--	--	--	0.0	0.0	0.1	0.3	0.3	0.0	0.1	0.1
Non-rebuilding species															
Arrowtooth flounder	3209.1	749.9	3959.0	--	--	--	--	22.8	22.8	3.8	71.4	75.2	0.0	--	0.0
Black rockfish (North of 46°16' N. lat.)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Black rockfish (South of 46°16' N. lat.)	0.3	--	0.3	--	--	--	--	--	--	--	--	--	151.7	1.5	153.2
Cabazon (South of 42° N. lat.)	--	--	--	--	--	--	--	--	--	--	--	--	22.9	0.4	23.3
California scorpionfish (South of 34°27' N. lat.)	--	--	--	0.0	0.3	0.4	--	--	--	--	--	--	3.0	0.0	3.0
Chilipepper rockfish (South of 40°10' N. lat.)	330.5	40.2	370.7	--	--	--	--	--	--	0.2	--	0.2	0.0	--	0.0
Dover sole	10319.1	523.7	10842.7	0.0	--	0.0	--	3.0	3.0	3.7	10.5	14.2	0.0	--	0.0
English sole	158.0	81.6	239.6	0.0	4.0	4.0	--	2.5	2.5	0.0	0.0	0.0	--	--	--
Lingcod (North of 42° N. lat.)	49.8	7.5	57.3	--	--	--	--	0.1	0.1	17.4	5.4	22.8	20.2	1.3	21.5
Lingcod (South of 42° N. lat.)	23.0	1.6	24.6	0.0	0.5	0.5	--	0.0	0.0	4.3	1.9	6.2	18.2	0.6	18.8
Longnose Skate	946.0	319.9	1266.0	--	0.1	0.1	--	0.4	0.4	26.2	77.1	103.2	0.0	--	0.0
Other flatfish	666.0	290.0	956.0	4.0	25.7	29.7	--	49.4	49.4	2.6	0.0	2.6	1.0	0.0	1.0
Other groundfish															
Big skate	1.2	31.8	33.0	--	24.5	24.5	--	--	--	0.0	1.3	1.3	--	--	--
Cabazon (Oregon)	0.0	--	0.0	--	--	--	--	--	--	--	--	--	23.5	0.1	23.6
Kelp greenling	--	0.0	0.0	--	--	--	--	--	--	--	--	--	19.9	0.5	20.4
Other Skates	193.1	9.1	202.2	0.7	20.1	20.8	--	0.0	0.0	17.4	0.9	18.3	0.1	0.0	0.1
Spiny dogfish	60.2	459.8	520.1	--	2.9	2.9	--	16.4	16.4	9.9	244.2	254.1	0.0	0.1	0.1
Unspecified grenadiers	107.4	191.9	299.3	--	--	--	--	--	--	29.6	35.0	64.6	0.1	--	0.1
Other	1.7	134.2	135.9	0.1	1.0	1.1	--	0.4	0.4	0.9	7.0	7.9	0.9	0.6	1.5
Minor rockfish (North of 40°10' N. lat.)															
Nearshore															
Blue rockfish	--	--	--	--	--	--	--	--	--	--	--	--	7.7	3.2	10.9
Remaining nearshore rockfish	0.0	--	0.0	--	--	--	--	--	--	--	--	--	8.2	0.1	8.4

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0 when a value is smaller than one decimal place.

Table 16 (continued).

	LE bottom trawl			California halibut			Pink shrimp			Non-nearshore fixed gear			Nearshore fixed gear		
	Landed	Discard	Estimate	Landed	Discard	Estimate	Landed	Discard	Estimate	Landed	Discard	Estimate	Landed	Discard	Estimate
Non-rebuilding species (cont.)															
Minor rockfish (North of 40°10' N. lat.) (cont.)															
Shelf															
Bocaccio	0.2	--	0.2	--	--	--	--	0.0	0.0	0.2	--	0.2	--	--	--
Chilipepper rockfish	0.3	0.2	0.5	--	--	--	--	0.0	0.0	0.0	--	0.0	--	--	--
Green spotted rockfish	0.0	0.0	0.1	--	--	--	--	--	--	0.0	--	0.0	--	--	--
Green striped rockfish	2.6	4.0	6.6	--	--	--	--	1.7	1.7	0.0	0.2	0.2	--	--	--
Red stripe rockfish	0.1	0.0	0.1	--	--	--	--	0.0	0.0	0.2	0.0	0.2	--	--	--
Silver gray rockfish	0.2	3.3	3.5	--	--	--	--	--	--	0.1	--	0.1	0.0	--	0.0
Remaining shelf rockfish	0.4	5.7	6.1	--	--	--	--	1.5	1.5	0.6	0.3	1.0	2.5	0.0	2.5
Slope															
Sharpchin rockfish	0.3	8.2	8.5	--	--	--	--	0.0	0.0	0.1	--	0.1	--	--	--
Splitnose rockfish	3.6	56.4	59.9	--	--	--	--	0.2	0.2	0.3	0.0	0.3	0.0	--	0.0
Yellowmouth rockfish	1.9	1.4	3.3	--	--	--	--	0.0	0.0	1.0	0.0	1.0	--	--	--
Remaining slope rockfish	118.7	113.3	232.0	--	--	--	--	0.1	0.1	80.9	36.2	117.1	0.0	--	0.0
Unspecified rockfish	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Minor rockfish (South of 40°10' N. lat.)															
Nearshore															
Blue rockfish	--	--	--	--	--	--	--	--	--	--	--	--	1.1	2.0	3.1
Gopher rockfish	--	--	--	--	--	--	--	--	--	--	--	--	27.2	1.5	28.8
Remaining nearshore rockfish	0.0	--	0.0	0.0	0.0	0.0	--	--	--	--	--	--	57.9	2.1	60.0
Shelf															
Green spotted rockfish	0.0	0.2	0.2	--	--	--	--	--	--	0.8	--	0.8	0.0	--	0.0
Green striped rockfish	--	2.8	2.8	--	--	--	--	--	--	0.0	0.0	0.1	--	--	--
Yellowtail rockfish	0.1	0.0	0.1	--	--	--	--	--	--	0.4	0.0	0.4	0.2	0.1	0.2
Remaining shelf rockfish	0.4	17.8	18.2	0.0	--	0.0	--	--	--	5.5	0.1	5.6	6.9	0.3	7.1
Slope															
Bank rockfish	13.9	0.1	13.9	--	--	--	--	--	--	0.1	--	0.1	0.0	--	0.0
Blackgill rockfish	61.4	--	61.4	--	--	--	--	--	--	83.6	0.6	84.2	0.5	--	0.5
Sharpchin rockfish	--	0.6	0.6	--	--	--	--	--	--	--	--	--	--	--	--
Remaining slope rockfish	4.8	2.0	6.8	0.0	--	0.0	--	--	--	3.0	5.5	8.5	0.0	--	0.0
Unspecified rockfish	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pacific cod (North of 43° N. lat.)	99.5	0.1	99.6	--	--	--	--	0.1	0.1	2.9	--	2.9	--	--	--
Pacific hake	365.8	392.5	758.3	--	--	--	--	398.9	398.9	0.0	0.6	0.6	--	--	--
Petrale sole	772.2	128.1	900.3	0.0	0.1	0.1	--	1.2	1.2	0.3	0.1	0.4	--	0.0	0.0
Sablefish (North of 36° N. lat.)	2511.1	237.3	2748.4	--	--	--	--	1.2	1.2	2671.8	97.0	2768.8	2.3	--	2.3
Sablefish (South of 36° N. lat.)	--	--	--	--	--	--	--	--	--	834.9	11.9	846.9	7.6	--	7.6

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0 when a value is smaller than one decimal place.

Table 16 (continued).

	LE bottom trawl			California halibut			Pink shrimp			Non-nearshore fixed gear			Nearshore fixed gear		
	Landed	Discard	Estimate	Landed	Discard	Estimate	Landed	Discard	Estimate	Landed	Discard	Estimate	Landed	Discard	Estimate
Non-rebuilding species (cont.)															
Shortbelly rockfish	0.0	4.4	4.4	--	--	--	--	0.2	0.2	--	--	--	--	--	--
Splitnose rockfish (South of 40°10' N. lat.)	47.6	89.1	136.7	--	--	--	--	--	--	0.0	0.1	0.1	--	--	--
Starry flounder	29.0	1.4	30.4	1.0	1.4	2.5	--	--	--	0.0	0.0	0.0	0.1	--	0.1
Thornyheads				--	--	--									
Longspine thornyhead (North of 34°27' N. lat.)	1323.4	371.6	1695.0	--	--	--	--	--	--	5.5	5.2	10.6	--	--	--
Longspine thornyhead (South of 34°27' N. lat.)	--	--	--	--	--	--	--	--	--	22.1	2.3	24.4	0.0	--	0.0
Shortspine thornyhead (North of 34°27' N. lat.)	1099.4	78.1	1177.5	--	--	--	--	0.2	0.2	45.6	38.1	83.7	0.2	--	0.2
Shortspine thornyhead (South of 34°27' N. lat.)	--	--	--	--	--	--	--	--	--	160.6	11.2	171.8	0.1	--	0.1
Mixed thornyheads	4.9	26.6	31.5	--	--	--	--	--	--	3.9	2.2	6.1	--	--	--
Yellowtail rockfish (North of 40°10' N. lat.)	13.7	16.5	30.2	--	--	--	--	0.2	0.2	0.5	0.1	0.5	0.7	0.2	0.9
Non-groundfish species															
California halibut	54.7	0.0	54.7	66.4	7.6	74.0	--	--	--	0.2	--	0.2	1.8	--	1.8
Dungeness crab	0.0	265.9	265.9	--	250.5	250.5	--	0.8	0.8	1.7	1.3	3.0	2.7	0.2	2.9
Eulachon	0.0	0.0	0.0	--	--	--	--	18.9	18.9	--	--	--	--	--	--
Other non-FMP flatfish	0.2	65.6	65.8	1.8	5.1	6.9	--	115.2	115.2	--	0.0	0.0	0.0	--	0.0
Other non-FMP skate	0.2	125.7	125.9	--	0.0	0.0	--	0.1	0.1	--	6.0	6.0	--	--	--
Tanner crab	0.0	454.5	454.5							0.2	6.4	6.6			

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0 when a value is smaller than one decimal place.

Table 17. Retained catch (mt), estimated discard (mt), and fishing mortality estimates (mt) of groundfish species in the 2010 at-sea and shoreside Pacific hake/whiting fisheries by sector. These fisheries occur north of the 40° 10' N latitude groundfish management line.

	Catcher-Processor			Mothership			Tribal			All At-Sea Hake Fisheries	Non-Tribal Shoreside Hake ¹
	Retained	Discard	Estimate	Retained	Discard	Estimate	Retained	Discard	Estimate	Estimate	Estimate
Rebuilding species											
Bocaccio (South of 40°10' N. lat.)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Canary rockfish	0.02	0.12	0.14	0.19	0.14	0.33	0.37	0.34	0.71	1.18	3.96
Cowcod (South of 40°10' N. lat.)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Darkblotched rockfish	1.39	1.30	2.69	2.36	3.12	5.48	0.00	0.00	0.00	8.17	6.74
Pacific ocean perch (North of 40°10' N. lat.)	1.90	1.81	3.72	10.27	2.45	12.72	0.33	0.08	0.40	16.84	6.17
Widow rockfish	2.53	2.48	5.01	14.66	19.37	34.02	3.72	1.73	5.45	44.49	54.14
Yelloweye rockfish	--	--	--	0.00	0.01	0.01	--	--	--	0.01	--
Non-rebuilding species											
Arrowtooth flounder	3.00	2.26	5.26	1.32	1.31	2.63	2.43	2.66	5.10	12.98	8.30
Black rockfish (North of 46°16' N. lat.)	--	--	--	--	--	--	--	--	--	--	--
Black rockfish (South of 46°16' N. lat.)	--	--	--	--	--	--	--	--	--	--	--
Cabezon (South of 42° N. lat.)	--	--	--	--	--	--	--	--	--	--	--
Dover sole	0.58	0.52	1.10	0.14	0.62	0.76	--	--	--	1.86	1.25
English sole	0.01	0.00	0.01	0.00	0.00	0.00	--	--	--	0.01	0.25
Lingcod (North of 42° N. lat.)	0.01	0.02	0.03	0.15	0.18	0.33	0.30	0.33	0.63	0.98	1.84
Lingcod (South of 42° N. lat.)	--	--	--	--	--	--	--	--	--	--	0.02
Longnose Skate	0.00	0.16	0.16	0.00	0.39	0.39	--	--	--	0.55	0.15
Other flatfish	4.77	3.93	8.70	0.21	1.52	1.73	--	--	--	10.43	6.85
Other groundfish											
Big skate	0.00	0.08	0.08	0.00	0.15	0.15	0.00	0.05	0.05	0.28	--
Cabezon (Oregon)	--	--	--	--	--	--	--	--	--	--	--
Kelp greenling	--	--	--	--	--	--	--	--	--	--	--
Other Skates	--	--	--	--	--	--	--	--	--	--	0.76
Spiny dogfish	7.53	102.89	110.42	1.41	43.98	45.39	7.89	114.02	121.91	277.72	124.60
Unspecified grenadiers	0.00	0.01	0.01	--	--	--	--	--	--	0.01	--
Other	0.44	0.19	0.63	0.01	0.09	0.10	0.00	0.00	0.00	0.73	3.61
Minor rockfish (North of 40°10' N. lat.)											
Nearshore											
Blue rockfish	--	--	--	--	--	--	--	--	--	--	--
Remaining nearshore rockfish	--	--	--	--	--	--	--	--	--	--	0.01

¹ Shoreside hake tribal landings are summarized in Table 19 under WA Tribal Landings.

Note: A value is (--) when the species was neither caught nor discarded (no value) or not reported for inclusion. Values appear as 0.00 when a value is smaller than two decimal places.

Table 17 (continued).

	Catcher-Processor			Mothership			Tribal			All At-Sea Hake Fisheries	Non-Tribal Shoreside Hake ¹
	Retained	Discard	Estimate	Retained	Discard	Estimate	Retained	Discard	Estimate	Estimate	Estimate
Minor rockfish (North of 40°10' N. lat.) (cont.)											
Shelf											
Bocaccio	0.03	0.17	0.19	0.75	0.35	1.10	0.30	0.34	0.64	1.94	0.05
Chilipepper rockfish	--	--	--	0.00	1.07	1.07	--	--	--	1.07	20.75
Greenspotted rockfish	--	--	--	--	--	--	--	--	--	--	--
Greenstriped rockfish	--	--	--	0.00	0.00	0.00	--	--	--	0.00	--
Redstripe rockfish	0.01	0.00	0.01	0.00	0.00	0.00	0.13	0.04	0.16	0.18	0.42
Silvergray rockfish	0.04	0.03	0.07	0.33	0.03	0.35	0.04	0.01	0.05	0.47	0.02
Remaining shelf rockfish	0.00	0.00	0.00	--	--	--	0.01	0.00	0.01	0.01	1.12
Slope											
Sharpchin rockfish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Splitnose rockfish	18.30	13.12	31.43	0.85	11.28	12.13	--	--	--	43.55	22.29
Yellowmouth rockfish	--	--	--	0.06	0.00	0.06	0.00	0.00	0.00	0.07	--
Remaining slope rockfish	9.84	6.84	16.68	3.12	1.65	4.77	0.03	0.00	0.03	21.48	23.46
Pacific cod (North of 43° N. lat.)	0.00	0.00	0.00	--	--	--	0.00	0.00	0.00	0.00	0.10
Pacific hake	54285.00	--	54285.00	35714.00	--	35714.00	16145.91	163.09	16309.00	106308.00	*56150.05
Petrale sole	--	--	--	--	--	--	--	--	--	--	0.06
Sablefish (North of 36° N. lat.)	5.04	2.39	7.43	1.02	3.93	4.95	--	--	--	12.38	18.11
Shortbelly rockfish	--	--	--	0.00	0.00	0.00	--	--	--	0.00	0.23
Starry flounder	--	--	--	--	--	--	--	--	--	--	0.31
Thornyheads											
Longspine thornyhead (North of 34°27' N. lat.)	0.00	0.00	0.01	--	--	--	--	--	--	0.01	0.02
Shortspine thornyhead (North of 34°27' N. lat.)	2.09	1.66	3.75	0.00	0.22	0.22	--	--	--	3.97	10.34
Mixed thornyheads	--	--	--	--	--	--	--	--	--	--	--
Yellowtail rockfish (North of 40°10' N. lat.)	8.03	13.02	21.05	35.58	10.70	46.28	67.56	15.18	82.74	150.07	185.00
Non-groundfish species											
California halibut	--	--	--	--	--	--	--	--	--	--	--
Dungeness crab	--	--	--	--	--	--	--	--	--	--	0.47
Eulachon	--	--	--	--	--	--	--	--	--	--	0.00
Other non-FMP flatfish	--	--	--	--	--	--	--	--	--	--	--
Tanner crab	--	--	--	--	--	--	--	--	--	--	--

* Includes a discard estimate of 214 mt, based on Electronic Monitoring (EM) data and Office of Law Enforcement (OLE) reports.

¹ Shoreside hake tribal landings are summarized in Table 19 under WA Tribal Landings.

Note: A value is (--) when the species was neither caught nor discarded (no value) or not reported for inclusion. Values appear as 0.00 when a value is smaller than two decimal places.

Table 18. Incidental fishery landings (mt) and exempted fishing permit (EFP) catch of groundfish from shoreside commercial fisheries in 2010 by sector and gear group.

	Shoreside Commercial Fisheries										Incidental fisheries estimate
	EFP (Excluding Midwater Trawl) ¹		PHLB Derby ²	Other Fisheries By Gear Group							
	Discard	Retained		HKL	MSC	NET	POT	TLS	TWL		
Rebuilding species											
Bocaccio (South of 40°10' N. lat.)	--	--	--	0.06	--	0.05	--	0.01	--	0.01	0.13
Canary rockfish	--	--	--	--	--	--	--	0.06	--	--	0.06
Cowcod (South of 40°10' N. lat.)	--	--	--	--	--	0.03	--	--	--	--	0.03
Darkblotched rockfish	--	0.00	0.03	0.17	--	--	--	--	--	--	0.20
Pacific ocean perch (North of 40°10' N. lat.)	--	0.13	0.00	0.01	--	--	--	--	--	--	0.14
Widow rockfish	--	--	--	0.00	--	--	--	0.01	--	0.00	0.01
Yelloweye rockfish	--	--	--	--	--	--	--	--	--	--	--
Non-rebuilding species											
Arrowtooth flounder	--	--	0.04	0.01	--	--	--	--	--	--	0.05
Black rockfish (North of 46°16' N. lat.)	--	--	--	--	--	--	--	--	--	--	--
Black rockfish (South of 46°16' N. lat.)	--	--	--	--	--	--	--	0.16	--	--	0.16
Cabazon (South of 42° N. lat.)	--	--	--	--	0.00	0.03	--	0.01	--	0.00	0.05
California scorpionfish (South of 34°27' N. lat.)	--	--	--	--	--	0.14	--	0.04	0.00	0.09	0.28
Chilipepper rockfish (South of 40°10' N. lat.)	--	0.00	--	--	--	--	--	0.02	--	--	0.02
Dover sole	0.74	0.00	0.02	0.00	--	0.01	--	0.00	--	--	0.79
English sole	--	--	--	--	--	--	--	--	0.00	--	0.00
Lingcod (North of 42° N. lat.)	--	0.02	0.52	0.16	--	--	0.02	1.96	--	--	2.68
Lingcod (South of 42° N. lat.)	--	--	0.03	0.42	0.01	0.03	0.32	0.27	--	0.01	1.07
Longnose Skate	10.80	1.96	0.22	0.01	--	--	--	--	--	--	12.99
Other flatfish	--	--	--	0.13	0.02	0.16	--	--	0.23	7.73	8.27
Other groundfish											
Big skate	--	--	--	--	--	0.00	--	--	--	--	0.00
Cabazon (Oregon)	--	0.00	--	--	--	--	--	--	--	--	0.00
Kelp greenling	--	--	--	--	--	--	--	--	--	--	--
Other Skates	0.04	--	0.96	0.43	--	5.70	--	--	0.04	1.61	8.77
Spiny dogfish	0.22	--	0.03	--	--	0.17	--	--	--	--	0.42
Unspecified grenadiers	0.22	0.42	--	--	--	--	--	--	--	--	0.64
Other	0.15	0.01	--	0.25	--	3.37	--	0.00	--	0.04	3.82

¹ Discard estimates reported for a groundfish EFP observed by WCGOP during 2010. Retained groundfish landings from all EFPs summarized from PacFIN.

² Pacific halibut derby landings were isolated if Pacific halibut was recorded on the fish ticket on the day of the opening or within two subsequent days.

Note: A value is (--) when the species was not landed (no value). Values appear as 0.00 when a value is smaller than two decimal places.

Table 18 (continued).

	Shoreside Commercial Fisheries										Incidental fisheries estimate
	EFP (Excluding Midwater Trawl) ¹		PHLB Derby ²	Other Fisheries By Gear Group							
	Discard	Retained		HKL	MSC	NET	POT	TLS	TWL		
Non-rebuilding species (cont.)											
Minor rockfish (North of 40°10' N. lat.)											
Nearshore											
Blue rockfish	--	--	--	--	--	--	--	--	--	--	--
Remaining nearshore rockfish	--	--	--	--	--	--	--	0.02	--	--	0.02
Shelf											
Bocaccio	--	--	--	--	--	--	--	0.00	--	--	0.00
Chilipepper rockfish	--	--	0.00	--	--	--	--	--	--	--	0.00
Greenspotted rockfish	--	--	0.04	--	--	--	--	--	--	--	0.04
Greenstriped rockfish	--	--	0.01	--	--	--	--	--	--	--	0.01
Redstripe rockfish	--	--	--	--	--	--	--	--	--	--	--
Silvergray rockfish	--	--	--	--	--	--	--	--	--	--	--
Remaining shelf rockfish	--	0.01	--	--	--	--	--	0.48	--	--	0.49
Slope											
Sharpchin rockfish	--	0.00	--	--	--	--	--	--	--	--	0.00
Splitnose rockfish	--	--	--	0.00	--	--	--	--	--	--	0.00
Yellowmouth rockfish	--	--	--	0.30	--	--	--	--	--	--	0.30
Remaining slope rockfish	--	0.00	0.16	1.45	--	--	0.06	0.05	--	--	1.72
Minor rockfish (South of 40°10' N. lat.)											
Nearshore											
Blue rockfish	--	--	--	--	0.00	--	--	0.00	--	--	0.00
Gopher rockfish	--	--	--	--	0.01	--	--	--	--	--	0.01
Remaining nearshore rockfish	--	--	--	--	0.08	0.01	--	0.05	--	--	0.15
Shelf											
Greenspotted rockfish	--	--	--	0.02	--	--	--	--	--	0.01	0.03
Greenstriped rockfish	--	--	--	--	--	--	--	--	--	--	--
Yellowtail rockfish	--	--	--	--	--	0.26	--	0.03	--	--	0.28
Remaining shelf rockfish	--	0.00	--	0.96	0.02	0.12	--	0.09	--	0.11	1.30
Slope											
Bank rockfish	--	--	--	--	--	--	--	--	--	--	--
Blackgill rockfish	0.11	5.43	--	0.16	--	0.02	--	0.04	--	--	5.76
Sharpchin rockfish	--	--	--	--	--	--	--	--	--	--	--
Remaining slope rockfish	0.00	0.09	--	--	--	--	--	--	--	0.02	0.11

¹ Discard estimates reported for a groundfish EFP observed by WCGOP during 2010. Retained groundfish landings from all EFPs summarized from PacFIN.

² Pacific halibut derby landings were isolated if Pacific halibut was recorded on the fish ticket on the day of the opening or within two subsequent days.

Note: A value is (-) when the species was not landed (no value). Values appear as 0.00 when a value is smaller than two decimal places.

Table 18 (continued).

	Shoreside Commercial Fisheries										Incidental fisheries estimate
	EFP (Excluding Midwater Trawl) ¹		PHLB Derby ²	Other Fisheries By Gear Group							
	Discard	Retained		HKL	MSC	NET	POT	TLS	TWL	TWS	
Non-rebuilding species (cont.)											
Pacific cod (North of 43° N. lat.)	--	--	0.02	--	--	--	--	0.00	--	--	0.03
Pacific hake	0.01	--	--	--	--	--	--	--	--	--	0.01
Petrale sole	--	0.13	0.05	--	--	0.00	--	--	--	0.00	0.18
Sablefish (North of 36° N. lat.)	--	0.03	8.44	--	--	--	--	1.37	--	--	9.84
Sablefish (South of 36° N. lat.)	5.21	176.58	--	--	0.01	1.61	--	--	--	--	183.42
Shortbelly rockfish	--	--	--	--	--	--	--	--	--	--	--
Splitnose rockfish (South of 40°10' N. lat.)	0.00	0.01	--	0.00	--	--	--	--	--	--	0.01
Starry flounder	--	--	--	0.00	--	--	--	--	--	0.13	0.13
Thornyheads											
Longspine thornyhead (North of 34°27' N. lat.)	--	0.11	--	0.01	--	--	--	--	--	--	0.12
Longspine thornyhead (South of 34°27' N. lat.)	--	--	--	0.01	--	--	--	--	--	--	0.01
Shortspine thornyhead (North of 34°27' N. lat.)	0.82	11.56	0.00	0.40	--	--	--	0.02	--	--	12.80
Shortspine thornyhead (South of 34°27' N. lat.)	--	--	--	0.04	--	0.02	--	--	--	--	0.06
Mixed thornyheads	0.01	--	--	--	--	0.02	--	--	--	--	0.03
Yellowtail rockfish (North of 40°10' N. lat.)	--	--	--	0.03	--	--	--	1.44	--	--	1.47
Non-groundfish species											
California halibut	--	--	--	55.43	0.01	46.65	0.04	0.38	0.50	13.34	116.35
Dungeness crab	--	0.06	--	0.00	16.99	--	22598.67	--	--	--	22615.72
Eulachon	--	--	--	--	--	--	--	--	--	--	--
Other non-FMP flatfish	0.00	--	--	--	--	0.01	--	--	0.08	3.40	3.50
Tanner crab	0.12	--	--	--	--	--	--	--	--	--	0.12

¹ Discard estimates reported for a groundfish EFP observed by WCGOP during 2010. Retained groundfish landings from all EFPs summarized from PacFIN.

² Pacific halibut derby landings were isolated if Pacific halibut was recorded on the fish ticket on the day of the opening or within two subsequent days.

Note: A value is (--) when the species was not landed (no value). Values appear as 0.00 when a value is smaller than two decimal places.

Table 19. Estimated fishing mortality (mt) of major west coast groundfish species in 2010 by sector.

	Shoreside commercial fisheries						WA tribal landings	All at-sea hake fisheries	Recreational fishing mortality			Research	Incidental fisheries	Estimated fishing mortality
	LE bottom trawl	CA halibut	Pink shrimp	Non-nearshore fixed gear	Nearshore fixed gear	Non-tribal shoreside hake			WA	OR	CA			
	Rebuilding species													
Bocaccio (South of 40°10' N. lat.)	12.9	--	--	0.9	0.5	--	NA	NA	NA	NA	57.2	0.6	0.1	72.3
Canary rockfish	2.4	--	0.0	0.0	5.9	4.0	8.2	1.2	1.0	4.2	14.5	1.9	0.1	43.2
Cowcod (South of 40°10' N. lat.)	0.6	--	--	--	--	--	NA	NA	NA	NA	0.4	0.1	0.0	1.2
Darkblotched rockfish	287.3	--	12.1	16.1	0.1	6.7	0.2	8.2	--	--	--	1.0	0.2	332.0
Pacific ocean perch (North of 40°10' N. lat.)	130.1	--	0.1	3.8	--	6.2	0.3	16.8	--	0.0	--	1.7	0.1	159.0
Widow rockfish	25.5	--	0.1	0.1	0.1	54.1	46.6	44.5	--	0.2	0.7	1.4	0.0	173.3
Yelloweye rockfish	0.1	--	0.0	0.3	0.1	--	0.4	0.0	2.0	2.8	1.3	0.5	--	7.6
Non-rebuilding species														
Arrowtooth flounder	3959.0	--	22.8	75.2	0.0	8.3	3.3	13.0	--	0.0	--	8.0	0.1	4089.6
Black rockfish (North of 46°16' N. lat.)	--	--	--	--	--	--	0.0	--	199.4	NA	NA	0.0	--	199.5
Black rockfish (South of 46°16' N. lat.)	0.3	--	--	--	153.2	--	--	--	NA	316.5	179.8	0.0	0.2	650.0
Cabazon (South of 42° N. lat.)	--	--	--	--	23.3	--	--	--	NA	NA	23.8	0.0	0.0	47.1
California scorpionfish (South of 34°27' N. lat.)	--	0.4	--	--	3.0	--	--	NA	NA	NA	63.0	0.0	0.3	66.7
Chilipepper rockfish (South of 40°10' N. lat.)	370.7	--	--	0.2	0.0	--	--	NA	NA	NA	2.8	1.7	0.0	375.5
Dover sole	10842.7	0.0	3.0	14.2	0.0	1.2	56.7	1.9	--	0.0	--	31.1	0.8	10951.7
English sole	239.6	4.0	2.5	0.0	--	0.2	62.3	0.0	--	0.0	0.0	2.5	0.0	311.2
Lingcod (North of 42° N. lat.)	57.3	--	0.1	22.8	21.5	1.8	34.2	1.0	67.8	90.2	NA	2.2	2.7	301.7
Lingcod (South of 42° N. lat.)	24.6	0.5	0.0	6.2	18.8	0.0	--	--	NA	NA	96.4	0.3	1.1	147.9
Longnose Skate	1266.0	0.1	0.4	103.2	0.0	0.1	1.3	0.6	--	0.0	--	1.7	13.0	1386.5
Other flatfish	956.0	29.7	49.4	2.6	1.0	6.8	17.8	10.4	1.5	0.5	43.7	16.6	8.3	1144.3
Other groundfish														
Big skate	33.0	24.5	--	1.3	--	--	--	0.3	--	0.0	--	1.7	0.0	60.9
Cabazon (Oregon)	0.0	--	--	--	23.6	--	--	--	5.4	19.6	NA	--	0.0	48.7
Kelp greenling	0.0	--	--	--	20.4	--	--	--	2.8	25.4	10.5	0.0	--	59.2
Other Skates	202.2	20.8	0.0	18.3	0.1	0.8	23.6	--	1.1	--	--	0.1	8.8	275.8
Spiny dogfish	520.1	2.9	16.4	254.1	0.1	124.6	6.9	277.7	--	0.1	1.6	10.2	0.4	1215.1
Unspecified grenadiers	299.3	--	--	64.6	0.1	--	--	0.0	--	--	--	--	0.6	364.7
Other	135.9	1.1	0.4	7.9	1.5	3.6	0.5	0.7	--	0.0	35.5	15.5	3.8	206.5
Minor rockfish (North of 40°10' N. lat.)														
Nearshore														
Blue rockfish	--	--	--	--	10.9	--	--	--	2.6	23.0	3.7	0.0	--	40.2
Remaining nearshore rockfish	0.0	--	--	--	8.4	0.0	--	--	6.4	13.9	6.2	0.0	0.0	34.9

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0 when a value is smaller than one decimal place.

Table 19 (continued).

	Shoreside commercial fisheries						WA tribal landings	All at-sea hake fisheries	Recreational fishing mortality			Research	Incidental fisheries	Estimated fishing mortality
	LE bottom trawl	CA halibut	Pink shrimp	Non-nearshore fixed gear	Nearshore fixed gear	Non-tribal shoreside hake			WA	OR	CA			
Non-rebuilding species (cont.)														
Minor rockfish (North of 40°10' N. lat.) (cont.)														
Shelf														
Bocaccio	0.2	--	0.0	0.2	--	0.0	0.0	1.9	0.8	0.1	--	0.0	0.0	3.2
Chilipepper rockfish	0.5	--	0.0	0.0	--	20.8	--	1.1	--	--	--	0.4	0.0	22.8
Greenspotted rockfish	0.1	--		0.0	--	--	--	--	--	0.0	0.0	0.0	0.0	0.2
Greenstriped rockfish	6.6	--	1.7	0.2	--	--	0.0	0.0	--	--	--	0.0	0.0	8.6
Redstripe rockfish	0.1	--	0.0	0.2	--	0.4	10.8	0.2	--	--	--	0.0	--	11.7
Silvergray rockfish	3.5	--	--	0.1	0.0	0.0	0.0	0.5	--	--	--	0.1	--	4.2
Remaining shelf rockfish	6.1	--	1.5	1.0	2.5	1.1	0.5	0.0	0.8	5.1	7.2	0.0	0.5	26.2
Slope														
Sharpchin rockfish	8.5	--	0.0	0.1	--	0.0	0.0	0.0	--	--	--	0.3	0.0	8.9
Splitnose rockfish	59.9	--	0.2	0.3	0.0	22.3	0.0	43.6	--	--	--	1.5	0.0	127.8
Yellowmouth rockfish	3.3	--	0.0	1.0	--	--	0.0	0.1	--	--	--	0.0	0.3	4.7
Remaining slope rockfish	232.0	--	0.1	117.1	0.0	23.5	24.2	21.5	--	0.0	--	0.2	1.7	420.4
Unspecified rockfish	--	--	--	--	--	--	--	--	--	--	--	3.7	--	3.7
Minor rockfish (South of 40°10' N. lat.)														
Nearshore														
Blue rockfish	--	--	--	--	3.1	--	--	NA	NA	NA	42.3	0.0	0.0	45.5
Gopher rockfish	--	--	--	--	28.8	--	--	NA	NA	NA	76.9	--	0.0	105.7
Remaining nearshore rockfish	0.0	0.0	--	--	60.0	--	--	NA	NA	NA	172.3	0.0	0.1	232.5
Shelf														
Greenspotted rockfish	0.2	--	--	0.8	0.0	--	--	NA	NA	NA	11.5	0.1	0.0	12.6
Greenstriped rockfish	2.8	--	--	0.1	--	--	--	NA	NA	NA	0.8	0.0	--	3.6
Yellowtail rockfish	0.1	--	--	0.4	0.2	--	--	NA	NA	NA	24.0	0.3	0.3	25.4
Remaining shelf rockfish	18.2	0.0	--	5.6	7.1	--	--	NA	NA	NA	175.2	2.1	1.3	209.5
Slope														
Bank rockfish	13.9	--	--	0.1	0.0	--	--	NA	NA	NA	0.1	0.2	--	14.3
Blackgill rockfish	61.4	--	--	84.2	0.5	--	--	NA	NA	NA	--	0.5	5.8	152.3
Sharpchin rockfish	0.6	--	--	--	--	--	--	NA	NA	NA	--	0.0	--	0.6
Remaining slope rockfish	6.8	0.0	--	8.5	0.0	--	--	NA	NA	NA	--	0.0	0.1	15.4
Unspecified rockfish	--	--	--	--	--	--	--	NA	NA	NA	--	4.0	--	4.0
Pacific cod (North of 43° N. lat.)	99.6	--	0.1	2.9	--	0.1	242.4	0.0	0.2	0.0	NA	1.2	0.0	346.5
Pacific hake	758.3	--	398.9	0.6	--	*56150.05	1967.9	106308.0	--	0.0	0.0	133.4	0.0	165717.2
Petrale sole	900.3	0.1	1.2	0.4	0.0	0.1	30.5	--	--	0.1	0.3	2.9	0.2	936.2

* Includes a discard estimate of 214 mt, based on Electronic Monitoring (EM) data and Office of Law Enforcement (OLE) reports.

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0 when a value is smaller than one decimal place.

Table 19 (continued).

	Shoreside commercial fisheries						WA tribal landings	All at-sea hake fisheries	Recreational fishing mortality			Research	Incidental fisheries	Estimated fishing mortality
	LE bottom trawl	CA halibut	Pink shrimp	Non-nearshore fixed gear	Nearshore fixed gear	Non-tribal shoreside hake			WA	OR	CA			
Non-rebuilding species (cont.)														
Sablefish (North of 36° N. lat.)	2748.4	--	1.2	2768.8	2.3	18.1	579.5	12.4	--	0.1	0.0	25.7	9.8	6166.5
Sablefish (South of 36° N. lat.)	--	--	--	846.9	7.6	--	--	NA	NA	NA	--	1.0	183.4	1038.9
Shortbelly rockfish	4.4	--	0.2	--	--	0.2	--	0.0	--	--	--	1.8	--	6.7
Splitnose rockfish (South of 40°10' N. lat.)	136.7	--	--	0.1	--	--	--	NA	NA	NA	--	2.9	0.0	139.8
Starry flounder	30.4	2.5	--	0.0	0.1	0.3	0.0	--	--	3.0	2.0	0.0	0.1	38.4
Thornyheads														
Longspine thornyhead (North of 34°27' N. lat.)	1695.0	--	--	10.6	--	0.0	0.0	0.0	--	--	--	12.8	0.1	1718.6
Longspine thornyhead (South of 34°27' N. lat.)	--	--	--	24.4	0.0	--	--	NA	NA	NA	--	1.3	0.0	25.7
Shortspine thornyhead (North of 34°27' N. lat.)	1177.5	--	0.2	83.7	0.2	10.3	16.0	4.0	--	--	--	3.5	12.8	1308.1
Shortspine thornyhead (South of 34°27' N. lat.)	--	--	--	171.8	0.1	--	--	NA	NA	NA	--	0.7	0.1	172.7
Mixed thornyheads	31.5	--	--	6.1	--	--	--	--	--	--	--	--	0.0	37.7
Yellowtail rockfish (North of 40°10' N. lat.)	30.2	--	0.2	0.5	0.9	185.0	535.7	150.1	38.5	7.6	0.4	4.2	1.5	954.8
Non-groundfish species														
California halibut	54.7	74.0	--	0.2	1.8	--	--	--	--	0.1	--	--	116.3	247.1
Dungeness crab	265.9	250.5	0.8	3.0	2.9	0.5	1420.5	--	--	--	--	0.0	22615.7	24559.8
Eulachon	0.0	--	18.9	--	--	0.0	--	--	--	0.0	--	0.1	--	19.1
Other non-FMP flatfish	65.8	6.9	115.2	0.0	0.0	--	--	--	--	--	--	0.0	3.5	191.5
Other non-FMP skate	125.9	0.0	0.1	6.0	--	--	--	--	--	--	--	--	--	132.0
Tanner crab	454.5	--	--	6.6	--	--	--	--	--	--	--	--	0.1	461.2

Note: A value is (--) when the species was neither caught nor discarded (no value). Values appear as 0.0 when a value is smaller than one decimal place.

Table 20. Estimated fishing mortality (mt) of major west coast groundfish species in 2010 and corresponding management reference points (harvest specifications).

	Estimated fishing mortality (mt)	Management reference points (harvest specifications)			
		Optimum Yield (mt)	Estimated mortality (as % of OY)	Allowable Biological Catch (mt)	Estimated mortality (as % of ABC)
Rebuilding species					
Bocaccio (South of 40°10' N. lat.)	72	288	25%	793	9%
Canary rockfish	43	105	41%	940	5%
Cowcod (South of 40°10' N. lat.)	1	4	29%	14	8%
Darkblotched rockfish	332	330	101%	440	75%
Pacific ocean perch (North of 40°10' N. lat.)	159	200	80%	1173	14%
Widow rockfish	173	509	34%	6937	2%
Yelloweye rockfish	8	14	54%	32	24%
Non-rebuilding species					
Arrowtooth flounder	4090	10112	40%	10112	40%
Black rockfish (North of 46°16' N. lat.)	199	464	43%	464	43%
Black rockfish (South of 46°16' N. lat.)	650	1000	65%	1317	49%
Cabazon (South of 42° N. lat.)	47	79	60%	111	42%
California scorpionfish (South of 34°27' N. lat.)	67	155	43%	155	43%
Chilipepper rockfish (South of 40°10' N. lat.)	376	2447	15%	2576	15%
Dover sole	10952	16500	66%	28582	38%
English sole	311	9745	3%	9745	3%
Lingcod (North of 42° N. lat.)	302	4829	9%	4058	9%
Lingcod (South of 42° N. lat.)	148			771	
Longnose Skate	1387	1349	103%	3269	42%
Other flatfish	1144	4884	23%	6731	17%
Other groundfish	2231	5600	40%	11200	20%
Big skate	61				
Cabazon (Oregon)	49				
Kelp greenling	59				
Other Skates	276				
Spiny dogfish	1215				
Unspecified grenadiers	365				
Other	207				
Minor rockfish (North of 40°10' N. lat.)	717	2283	31%	3678	20%
Nearshore	75	155	48%		
Blue rockfish	40			**	
Remaining nearshore rockfish	35			**	
Shelf	77	968	8%		
Bocaccio	3			**	
Chilipepper rockfish	23			**	
Greenspotted rockfish	0			**	
Greenstriped rockfish	9			**	
Redstripe rockfish	12			**	
Silvergray rockfish	4			**	
Remaining shelf rockfish	26			**	

** ABCs are not available for these species. ABC values that are listed for these species in other sources represent ABC contributions to the Minor Rockfish ABCs.

Table 20 (continued).

	Estimated fishing mortality (mt)	Management reference points (harvest specifications)			
		Optimum Yield (mt)	Estimated mortality (as % of OY)	Allowable Biological Catch (mt)	Estimated mortality (as % of ABC)
Non-rebuilding species (cont.)					
Minor rockfish (North of 40°10' N. lat.)					
Slope	562	1160	48%		
Sharpchin rockfish	9			**	
Splitnose rockfish	128			**	
Yellowmouth rockfish	5			**	
Remaining slope rockfish	420			**	
Unspecified remaining rockfish	4				
Minor rockfish (South of 40°10' N. lat.)	821	1990	41%	3382	24%
Nearshore	384	650	59%		
Blue rockfish	45			**	
Gopher rockfish	106			**	
Remaining nearshore rockfish	233			**	
Shelf	251	714	35%		
Greenspotted rockfish	13			**	
Greenstriped rockfish	4			**	
Yellowtail rockfish	25			**	
Remaining shelf rockfish	210			**	
Slope	183	626	29%		
Bank rockfish	14			**	
Blackgill rockfish	152			**	
Sharpchin rockfish	1			**	
Remaining slope rockfish	15			**	
Unspecified remaining rockfish	4				
Pacific cod (North of 43° N. lat.)	346	1600	22%	3200	11%
Pacific hake	165717	193935	85%	336560	49%
Petrale sole	936	1200	78%	2751	34%
Sablefish (North of 36° N. lat.)	6167	6471	95%	9217	78%
Sablefish (South of 36° N. lat.)	1039	1258	83%		
Shortbelly rockfish	7	6950	0%	6950	0%
Splitnose rockfish (South of 40°10' N. lat.)	140	461	30%	615	23%
Starry flounder	38	1077	4%	1578	2%
Thornyheads					
Longspine thornyhead (North of 34°27' N. lat.)	1719	2175	79%	3671	48%
Longspine thornyhead (South of 34°27' N. lat.)	26	385	7%		
Shortspine thornyhead (North of 34°27' N. lat.)	1308	1591	82%	2411	61%
Shortspine thornyhead (South of 34°27' N. lat.)	173	410	42%		
Mixed thornyheads	38				
Yellowtail rockfish (North of 40°10' N. lat.)	955	4562	21%	4562	21%

** ABCs are not available for these species. ABC values that are listed for these species in other sources represent ABC contributions to the Minor Rockfish ABCs.