

Agenda Item D.2.b
NMFS Report
September 2010

Pacific Halibut Bycatch in the U.S. West Coast Groundfish Fishery from 2002 through 2009

Eliza Heery², Marlene A. Bellman¹, and Janell Majewski¹

¹West Coast Groundfish Observer Program
Fishery Resource Analysis and Monitoring Division
National Marine Fisheries Service

²Pacific States Marine Fisheries Commission
Northwest Fisheries Science Center
2725 Montlake Blvd E
Seattle, WA 98112

Publication Date: September 1, 2010

This document should be cited as follows:

Heery, E., Bellman, M.A., and J. Majewski. 2010. Pacific halibut bycatch in the U.S. west coast groundfish fishery from 2002 through 2009. West Coast Groundfish Observer Program. NWFSC, 2725 Montlake Blvd E., Seattle, WA 98112.



TABLE OF CONTENTS

INTRODUCTION	4
METHODS	6
<i>Data sources</i>	6
<i>Limited entry bottom trawl sector</i>	7
Evaluation of strata	7
Bycatch estimation.....	9
Viability Analysis	12
Length frequencies.....	13
<i>Non-nearshore fixed gear sector</i>	14
Evaluation of appropriate strata	14
Bycatch estimation.....	15
Discard mortality rates.....	17
<i>Other fishery sectors</i>	18
RESULTS	19
<i>Limited entry bottom trawl sector</i>	19
<i>Non-nearshore fixed gear sector</i>	20
<i>Other fishery sectors</i>	22
SUMMARY & CONCLUSIONS	22
ACKNOWLEDGEMENTS	23
REFERENCES	23
FIGURES	26
TABLES	35
APPENDIX A	50
APPENDIX B	53
APPENDIX C	62

INTRODUCTION

Pacific halibut (*Hippoglossus stenolepis*) is found in coastal waters throughout the North Pacific Region. Off the west coast of the United States, it inhabits continental shelf areas (< 150 fm) from Washington to central California (Clark and Hare 1998). This species has long supported a directed commercial fishery in the US and Canada, but it is also caught as bycatch in other fisheries that target demersal species inhabiting similar depths and seafloor habitat types. The primary objective of this report is to provide estimates of Pacific halibut bycatch in the U.S. west coast groundfish fishery from 2002-2009.

The west coast groundfish fishery is a multi-species fishery that utilizes a variety of gear types. The fishery harvests species designated in the Pacific Coast Groundfish Fishery Management Plan (FMP; PFMC 2008) and is managed by the Pacific Fishery Management Council (PFMC). There are 89 species listed in the groundfish FMP, including a variety of rockfish, flatfish, roundfish, skates, and sharks (see Appendix A). These species are found in both federal (> 3 Nm) and state waters (0-3 Nm). Groundfish are both targeted and caught incidentally by trawl nets, hook-and-line gears, and fish pots.

Under the FMP, the groundfish fishery is defined as consisting of four management components:

- Limited Entry (LE) – The LE component includes all commercial fishers who hold a federal limited entry permit. The total number of limited entry permits available is capped and permitted vessels are allotted a larger portion of the total allowable catch for commercially desirable species than non-permitted vessels.
- Open Access (OA) – The OA component includes commercial fishers who are not federally permitted. However, state agencies (California Department of Fish and Game and Oregon Department of Fish and Wildlife) have instituted permit programs for certain OA sectors.
- Recreational – This component includes recreational anglers who target or incidentally catch groundfish species.
- Tribal – This component includes native tribal commercial fishers in Washington state that have treaty rights to fish groundfish.

These four components can then be further subdivided into sectors based on gear type, target species, permits and various regulatory factors. Commercial LE and OA sectors have traditionally caught the largest quantities of groundfish and are observed by the West Coast Groundfish Observer Program (WCGOP).

The WCGOP was established in May 2001 by NOAA Fisheries (NMFS) in accordance with the Pacific Fishery Management Plan (50 CFR Part 660) (50 FR 20609). This regulation requires that all vessels that catch groundfish in the US EEZ from 3-200 miles offshore to carry an observer when notified to do so by NMFS or its designated agent. Subsequent state rule-making has extended NMFS's ability to require that California and Oregon vessels, which only fish in

the 0-3 mile state territorial zone, also carry observers. WCGOP observers are stationed along the US west coast from Bellingham, Washington to San Diego, California.

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

Pacific halibut is consistently caught as bycatch in two of the fishery sectors observed by the WCGOP: the LE bottom trawl sector and the sablefish (non-nearshore) fixed gear sector. The LE bottom trawl sector operates from the Canadian border to Morro Bay, California. Vessels in this sector must have a federal groundfish permit with a trawl endorsement. LE bottom trawl vessels range in size from 35 to 95 feet and fish throughout the year in a wide range of depths. Bottom trawlers often target species assemblages, which can result in diverse catch. A single groundfish bottom trawl tow often includes fifteen to twenty species. Fish size and weight of the total catch also vary widely. LE bottom trawl vessels deliver the portion of their catch that is marketable and permitted to be landed to shoreside processors. The portion of the catch that is prohibited by regulations or not marketable is discarded at-sea. Pacific halibut is considered a "prohibited species" in the LE bottom trawl sector, and all specimens caught as bycatch must be discarded.

The non-nearshore fixed gear fishery sector consists of 3 major components: the LE sablefish-primary, the LE sablefish non-primary, and the OA components. A federal groundfish permit is required to participate in either LE component. In addition, a tier endorsement is required to participate in the LE sablefish-primary component of the fixed gear sector. Although federal or state permits are not required to participate in the OA fixed gear sector, this portion of the fishery is subject to daily trip limit regulations set forth by PFMC. The same is true for LE non-primary vessels and for tier-endorsed LE vessels that have either reached their quota or are fishing outside of the sablefish primary season, which takes place from April to the end of October. Fixed gear vessels deploy pots and a variety of hook-and-line gears. However, the majority of directed sablefish effort is carried out using longlines. Pacific halibut is a "prohibited species" in the non-nearshore fixed gear sector with one exception. Prior to 2010, tier-endorsed (sablefish primary) vessels that fished with longline gear North of Point Chehalis, Washington (46° 53.30' N. lat.) were allotted some Pacific halibut landings. This regulation was modified in 2010 such that Pacific halibut can no longer be landed by any fixed gear vessels targeting FMP groundfish, due to a low total allowable catch for International Pacific Halibut Commission (IPHC) area 2A off the US west coast.

The WCGOP also observes the commercial nearshore sectors in Oregon and California, which target FMP groundfish typically in waters shallower than 50 fathoms. In addition, it provides

observer coverage for the pink shrimp and California halibut trawl fisheries. Pacific halibut bycatch is rare in these fishery sectors, occurring on a maximum of 8% of observed tows/sets annually. Although we provide our best estimates of Pacific halibut fishing mortality in nearshore, pink shrimp and California halibut sectors, we point to previous WCGOP data reports to supply more comprehensive information about each of these sectors and their annual observed catch of Pacific halibut (www.nwfsc.noaa.gov/research/divisions/fram/observer/). For a list of groundfish sectors that are not covered by the program, see the description of observer coverage provided by Bellman et al. (2009) in the annual report on estimated total mortality of groundfish species.

Pacific halibut is managed by the IPHC, a body founded through treaty agreement between the US and Canada. The IPHC oversees the implementation of a directed Pacific halibut fishery on the US west coast using a derby fishery system with 10-hour openings. Many of the vessels that are observed by the WCGOP as part of the LE and OA fixed gear sectors participate in the directed fishery, but are not covered by the WCGOP while doing so.

This report combines discard estimates from both the LE bottom trawl sector and the non-nearshore fixed gear sector, which have historically been computed by different authors and presented in separate reports. The most recently published versions of each report are Wallace and Hastie (2009) for LE bottom trawl discard estimates, and Heery and Bellman (2009) for groundfish non-nearshore fixed gear discard estimates. The methodology employed in each of these reports was reviewed in 2010 and updates based on that review have been employed in the current analysis. In addition, we provide data summaries from the nearshore fixed gear sector, which catches and discards a small amount of Pacific halibut annually.

METHODS

Data sources

Data sources for this analysis include onboard observer data (from the WCGOP), trawl logbook data, and landing receipt data (referred to as fish tickets). The WCGOP coverage plan details program goals, vessel selection, observer coverage, and basic data collection (NWFSC 2006a). 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 2006b).

The sampling protocol employed by the WCGOP is primarily focused on the discarded portion of catch. In order to ensure that the recorded weights for the retained portion of the observed catch are accurate, haul-level retained catch weights recorded by WCGOP observers are adjusted based on trip-level fish ticket records. This process is described in further detail in annual reports produced by the WCGOP (www.nwfsc.noaa.gov/research/divisions/fram/observer/datareport/index.cfm) and was conducted prior to the analyses presented in this report.

Fish ticket landing receipts are completed by fish-buyers in each port for each delivery of fish by a vessel. Fish tickets are trip-aggregated sales receipts for market categories that may represent

single or multiple species. They are issued to fish-buyers by a state agency and must be returned to the agency for processing. Fish ticket and species-composition data are submitted by state agencies to the Pacific Fisheries Information Network (PacFIN) regional database. Annual fish ticket landings data were retrieved from the PacFIN database and subsequently divided into various sectors of the groundfish fishery as indicated in Figure 1.

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 data are then submitted by state agencies to the PacFIN regional database. Trawl logbook data for 2002 through 2009 were retrieved from the PacFIN database and processed further as indicated in Figure 1.

When Pacific halibut are encountered on an observed vessel, WCGOP observers select a random sample of specimens and record length and viability. Lengths are determined through visual estimation or direct measurement. Although we summarize length frequency data in this report, it is not incorporated in our analysis. Viabilities are collected according to a protocol from the IPHC, which is utilized by the North Pacific Groundfish Observer Program as well. Viability information was used to compute discard mortality rates (DMR) whenever possible.

Limited entry bottom trawl sector

Evaluation of strata

In previous reports on Pacific halibut bycatch in the LE bottom trawl sector, observer data were stratified by season, depth, area, and retained catch of arrowtooth flounder per tow hour. These strata were designated based on an analysis by Wallace (2000) that evaluated the significance of various categorical variables in determining the catch per tow hour of Pacific halibut. The data employed to conduct that analysis originated from the EDCP observer program and were collected between 1996 and 1998 (Wallace 2000). The efficacy of this stratification system was then verified annually (J. Wallace, personal communication, May 2010).

A substantial amount of observer data is now available for analysis, as the WCGOP has been collecting data on Pacific halibut bycatch in the LE bottom trawl sector since 2002. We applied the same methods as Wallace (2000) and used tree-based models (Clark and Pregon 1992) both to confirm previous findings and establish new stratification that could be used consistently across all years of observer data. Furthermore, we employed an additional constraint that all strata include data from three vessels or more. This constraint is required under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) for confidentiality purposes, but also ensures a sufficient sample size in observer data for subsequent analyses. We recognize that strata in which no fishing occurred would presumably enhance the reliability of overall bycatch estimates expanded to the fleet-wide level, since a zero valued estimate has a variance of zero. However, the LE bottom trawl fleet has a wide spatial and temporal distribution (Figure 2) and isolating strata without any logbook or observer data records was not feasible.

Wallace (2000) evaluated the effectiveness of several variables at predicting observed catch-per-unit-effort (CPUE) of Pacific halibut, defined as the observed catch weight (kg) per tow hour. This response variable was defined in the same way as the bycatch ratio later applied to estimate fleet-wide bycatch amounts. Ratio estimators (Cochran 1977) have been widely used in bycatch estimation (Stratoudakis et al. 1999, Walmsley et al. 2007, Borges et al. 2005a). The method relies heavily on the assumption that bycatch is proportional to some metric or proxy of fishing effort, in this case tow duration (Rochet and Trenkel 2005). Rochet and Trenkel (2005) note that this assumption is often not supported by the data, and that in some cases, bycatch may vary nonlinearly or even be unrelated to the ratio estimator denominator. Variability in this relationship is quite high at the tow level (Borges et al. 2005b), and tows are not considered independent within the sampling framework used by the WCGOP. However, the explanatory variables that are generally thought to relate to Pacific halibut bycatch (latitude, depth, catch of other species) coincide with individual tows. Figure 3a demonstrates that on a coastwide basis and across all years observed, it is difficult to identify a clear relationship between Pacific halibut bycatch at the tow level and tow duration. To some extent the lack of an obvious relationship may be attributed to the fact that biomass and catchability are not constant over space and time (as $C/E = Bq$ and the plot includes observer data from all locations along this coast from 2002 through 2009). While we would expect to see a linear pattern within components of the data in which Pacific halibut biomass and catchability are constant, it is difficult to identify these components without a much more comprehensive understanding of the stock's dynamics. We do see a more linear pattern when the data are split out by latitude, depth, year, and month, and re-plotted. For instance, Figure 3b shows the relationship between catch and tow hours in May 2009, in the area north of Point Chehalis, Washington, on the continental shelf, between 50 and 250 fathoms. Most of the area within this range in which observed vessels are fishing is characterized by gradually sloping sandy bottom habitat. Within a single month over a consistent bottom type such as this, we might expect biomass and catchability to be relatively constant, and thus for the relationship between catch and effort to be linear. In relation to Pacific halibut bycatch, tow duration appears to vary in a similar way to other proxies of effort, such as retained catch of target species. Because of this, there was no apparent advantage to using an alternative denominator, and we therefore maintained the status quo of tow hours.

In accordance with methods by Wallace (2000), we plotted Pacific halibut CPUE in relation to latitude, depth, and season in order to identify natural breaks in the data. In this initial examination, Pacific halibut CPUE increased with increasing latitude, particularly in the area north of 47° N latitude. CPUE decreased with increasing depth, with a noticeable break between 100 and 150 fathoms, presumably caused by the lack of effort in this area as a result of spatial closures. These findings were in agreement with those from Wallace (2000), however, we were unable to distinguish seasonal patterns in the data.

We then examined the relationship between Pacific halibut CPUE and the retained catch of other species per tow hour, applying a log transformation to both variables. All FMP groundfish species were considered (Appendix A). The strongest relationships that were apparent graphically were with arrowtooth flounder, petrale sole, and lingcod. In addition, we found potential relationships with Pacific cod, skates, yellowtail rockfish and Pacific ocean perch. The retained catch per tow hour was thus considered as a potential level of additional stratification in subsequent steps.

A tree-based model (Clark and Pregon 1992) was applied to all potential stratification variables in order to identify breaks in the data that were most significant. A generalized linear model (GLM) was then used to evaluate the significance of each combination of variables, with Pacific halibut discard per tow hour as the response variable. A constraint was applied to ensure that strata contained at least 3 vessels and Akaike's Information Criterion (AIC) values from each run of the model were then compared. The variables and stratification lines supported by this process were as follows:

Variable	Stratification
Latitude	north / south of 47.1518° N. latitude
Depth	shallower / deeper than 60.5 fm
Retained catch of other species	greater than / less than 125 kg per tow hour of all species tested (arrowtooth flounder, petrale sole, lingcod, Pacific cod, skates, yellowtail rockfish, and Pacific ocean perch)

Season was excluded as a potential stratification variable, as it did not improve model fit. In order to make estimates relevant within a management framework, Point Chehalis, Washington (46° 53.30' N. lat.), the closest geographic coordinate used in groundfish management to the latitudinal break supported by the model, was employed to define latitudinal strata. Tows were stratified by depth as greater than or less than 60 fathoms. The AIC values associated with this adjusted model still demonstrated a considerable improvement over all other latitudinal and depth-based stratification schemes evaluated (except for that selected through tree regression, for which AIC was slightly lower) while maintaining the constraint that strata contain data from at least 3 vessels in all years. Table 1 summarizes observer coverage within each area and depth strata.

Bycatch estimation

Once the stratification scheme had been determined, we applied a deterministic approach to estimate bycatch of Pacific halibut in the LE bottom trawl sector. Through this approach, observed bycatch rates for Pacific halibut were directly expanded based on the total fleet effort (hours towed) (Table 1). Fleet effort was derived from trawl vessel logbooks.

Since logbooks are not available from 100% of the fleet, it was necessary to adjust logbook effort based on fish tickets, which are considered a more complete census of fleet-wide data and are legally binding documents. Washington Department of Fisheries and Wildlife (WDFW) calculates an expanded trawl effort amount to account for logbooks that were not submitted to the agency (Sampson and Crone 1997). Although this value has been used in previous reports on Pacific halibut bycatch in the LE bottom trawl sector (Wallace and Hastie 2009), we found that this data field was blank (did not contain a value) in some of the data when working at the tow level. Logbook effort for Washington, Oregon and California was instead adjusted based on the ratio of the total FMP groundfish catch reported on fish tickets to that reported in logbooks. This ratio was computed separately for each state and month and was then multiplied by the total tow hours from each haul associated with landings in that month and state:

$$r_{ap} = \frac{L_{ap}}{W_{ap}}$$

$$H_{adj_{iap}} = H_{iap} \times r_{ap}$$

where:

r_{ap} = adjustment ratio

L_{ap} = lbs of FMP groundfish recorded on fish tickets in state a and month p

W_{ap} = lbs of FMP groundfish recorded in vessel logbooks from state a , in month p

H_{iap} = logbook tow hours from tow t , which landed its catch in state a during month p

$H_{adj_{iap}}$ = adjusted logbook tow hours from tow t , which landed its catch in state a during month p

The adjustment ratio was then applied to logbook tow hours at the tow level in order to enable subsequent stratification of the data by area, depth, and CPUE of other species. Wallace and Hastie (2009) adjusted logbook tow hours based on an adjustment ratio that was computed for each port and month. In our evaluation, we found this approach to yield ratios with relatively small and highly variable numerators and denominators. Rather than averaging across port/month strata, we decided to aggregated logbook and fish ticket data at a higher level. The objective of adjusting logbook data was to account for submission rates of less than 100%. Since the logbook program is implemented at the state level and the data are entered into state databases, we decided to aggregate by state. Logbooks are submitted on a monthly basis (Sampson and Crone 1997) and change over time. We therefore maintained month as a variable used to aggregate data prior to computing adjustment ratios.

Previous reports on Pacific halibut bycatch in the LE bottom trawl fishery have focused on observed bycatch associated with vessels landing in Oregon and Washington only (Wallace and Hastie 2009). Some vessels from Oregon do fish and encounter Pacific halibut south of the California/Oregon border. A small amount of Pacific halibut is also caught in this area by vessels that are based in California and land their catch in California ports. The current analysis attempts to provide a comprehensive view of bycatch in the LE bottom trawl sector across all years in which observer data are available. Observer and logbook data from California were therefore included in our analysis.

LE bottom trawl vessels may 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 in logbook and observer data 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 criteria were removed from the LE bottom trawl dataset and included in bycatch estimation for the California halibut trawl fishery (see below). Whether in observer or logbook data, the tow target was typically determined by the vessel captain.

Next, both observer and logbook data were stratified based on the stratification scheme described in the previous section, with 2 area strata, 2 depth strata, and 2 CPUE strata. A discard ratio (R_{ij}) was then computed from all observed tows within stratum i and year j as:

$$R_{ij} = \frac{\sum_t y_{ijt}}{\sum_t x_{ijt}}$$

where:

y_{ijt} = observed discard of Pacific halibut (kg) in stratum i and year j during tow t
 x_{ijt} = observed tow hours in stratum i and year j from tow t

The variance of R_{ij} was approximated by using the following equation (Cochran 1977):

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

where:

\bar{y}_{ij} and \bar{x}_{ij} = the means of y_{ijt} and x_{ijt}
 $s^2(y_{ijt})$ and $s^2(x_{ijt})$ = the variances of y_{ijt} and x_{ijt}

This variance estimator is that which was employed by Pikitch et al. (1998) and is based on methods presented by Cochran (1977). Note that $Var(R_{ij})$ cannot be calculated when $x_{ijt} = 0$ or $y_{ijt} = 0$ for all tows. The lower and upper bounds of a 95% confidence interval were computed as follows:

$$l_{lower} = \frac{\bar{y}_{ij}}{\bar{x}_{ij}} - 1.96(\sqrt{Var(R_{ij})})$$

$$l_{upper} = \frac{\bar{y}_{ij}}{\bar{x}_{ij}} + 1.96(\sqrt{Var(R_{ij})})$$

In order to best support fishery management, variance and confidence intervals were calculated separately for data in each geographic area, depth, and CPUE stratum (Table 2). Variance estimates, therefore, do not relate back directly to the random stratified sampling framework employed by the WCGOP, where vessels within each port group were the sampling unit. This may introduce bias into variance estimates. Although variance computed from the observer data is still provided in the same way it has been in previous reports (Wallace and Hastie 2009), it should be considered with caution.

Discard ratios were then multiplied by the total adjusted tow hours (H_{adj}) within each stratum to produce a series of initial bycatch estimates (B_{ij}):

$$B_{ij} = R_{ij} \times \sum_t H_{adj_t}$$

The product B_{ij} represents the total, or gross estimated bycatch weight within stratum i and year j . This includes all discarded fish, regardless of whether the fish survived after being returned at sea.

Viability Analysis

In order to compute the total mortality of discarded Pacific halibut, discard mortality rates were computed through an additional viability analysis (Tables 3 and 4). WCGOP observers collect viability data on discarded Pacific halibut in the LE bottom trawl fishery using the condition key provided in Appendix L of the WCGOP manual (NWFSC 2006b). Observations of several condition characteristics are used to assign each fish that is evaluated to one of three categories: Excellent, Poor, or Dead (Williams and Chen 2004).

In order to account for the impact of size on survivorship, we computed a weighted average mortality rate for each condition category. Viabilities were grouped based on coinciding length measurements in to 2 cm bins. The weight associated with the midpoint of each length bin was then multiplied by the total number of observations from each condition category. Weights were determined based on the IPHC length weight relationship:

$$W_m = 6.921 \times 10^{-6} \cdot L_m^{3.24}$$

where:

L_m = fork length (cm) at the midpoint of length bin m

W_m = weight (lb, head off, eviscerated) in length bin m

The product of the number of fish and the weight associated with each length bin was then summed for each condition category. A weighted average discard mortality rate for each condition category was computed based on the following equations:

$$P_{csj} = \sum_m n_{csjm} \times W_{csjm}$$

$$DMR_{csj} = m_c \times P_{csj}$$

where:

n_{csjl} = number of Pacific halibut recorded in condition c , stratum s , year j , and length bin m

m_c = mortality rate for condition c

P_{csj} = proportion of Pacific halibut in condition c , in stratum s in year j

DMR_{csj} = discard mortality rate in condition c (Excellent, Poor, or Dead), in stratum s in year j

Mortality rates used for each of the condition categories (m_c) are as follows (Clark et al. 1992):

m_c	Rate
m_{exc}	0.20
m_{poor}	0.55
m_{dead}	0.90

These rates are originally based on mortality data collected by Hoag (1975), who found some survivorship among fish in the dead condition category. Discard mortality rates for each

condition category c and stratum s were then multiplied by gross discard estimates to compute total estimated discard mortality:

$$F_{ij} = \sum_c B_{ij} \times DMR_{cjs}$$

where:

F_{ij} = total estimated discard mortality in stratum i in year j

The variables used to define strata for discard mortality rates (s) and gross discard estimates (i) differed because of differences in the way viabilities and gross estimates are stratified. Viability data are collected from only a subsample of the Pacific halibut that observers encounter. Stratification of viability data by latitude, depth, CPUE strata, and year results in very small sample sizes. Based on previous evaluations by Wallace and Hastie (2009), we expect that survivorship of Pacific halibut in the trawl fishery is most directly affected by the length of the tow and the amount of catch that fills the net. These variables are not part of the bycatch ratio stratification process described in previous sections, and their use in stratifying viability data would make it difficult to then apply discard mortality rates to initial gross estimates of bycatch. We found that tow duration was directly related to depth (Figure 4), one of the variables that was used to stratify discard ratios and initial gross discard estimates. This relationship is attributed to the time it takes to fish trawl gear in deeper versus shallow waters and the smaller amount of consistent seafloor type that is available for trawling in shallow areas. Smaller areas of seafloor are available both because of the bottom habitat type and because of smaller trip limits associated with areas shoreward of the trawl Rockfish Conservation Area (RCA). In shallower areas, vessels are more likely to fish with a larger number of short tows, compared with vessels fishing a smaller number of longer-duration tows in deeper areas. Since depth and tow duration appeared to co-vary, we used only depth to stratify viability data from each year (Tables 3 and 4). This essentially assumed that the physical condition of discarded Pacific halibut was not related to tow location.

Viability data are available from 2004 onward. For 2002 and 2003, we applied a discard mortality rate computed by summing the averages weights in each condition category across all years. Final estimates of Pacific halibut bycatch and discard mortality are presented in Table 5. Results from our review of stratification alternatives analyzed for the LE bottom trawl sector are summarized in Table 6 for reference.

Length frequencies

The length frequency distribution for Pacific halibut in the 2009 trawl fishery is provided as supplementary information in Table 7. Pacific halibut pose unique challenges for observer sampling. When catch from a trawl net is dumped on deck, most vessels' crew will scan the catch for Pacific halibut and immediately return them to sea, which is termed "presorting". Vessels presort Pacific halibut to increase the likelihood of survival of the discarded fish. In addition to the need for quickly returning Pacific halibut to the sea in order to enhance survival, halibut are often too heavy and/or awkward to weigh in observer baskets. Therefore, in most circumstances observers visually estimate the length of the halibut in ten-centimeter units (40cm,

50cm , 60cm, etc.), which are later converted to weight using the IPHC length/weight conversion table. Observers also have the option of directly measuring a Pacific halibut and then converting the measurement to weight using the IPHC length/weight conversion table or actually weighing the individual fish, but these rarely occur.

Non-nearshore fixed gear sector

Evaluation of appropriate strata

Testing of alternative stratification schemes indicated that latitude and gear type were the most important variables with respect to Pacific halibut bycatch in the fixed gear fishery. The WCGOP samples each fixed gear sector through a separate random selection process, with LE primary permits receiving the highest level of coverage and OA fixed gear the lowest. Given this sampling structure and anticipated differences in variance from one sector to the next, we chose to maintain sector as a stratification variable in our analysis. Bycatch estimates were therefore produced separately for each sector and gear combination. Latitudinal strata were also applied whenever there were sufficient data and the added stratification was shown to significantly improve the fit of predicted bycatch amounts to the amounts observed.

The largest number of Pacific halibut bycatch events observed in the fixed gear fishery was on LE primary vessels fishing off of Washington with longline gear. For this sector/gear combination there were sufficient data to evaluate the efficacy of additional variables for predicting bycatch. We considered a variety of additional parameters, including latitude, state of landing, season, month, and bimonthly period. Each of these was used as an explanatory variable in a generalized linear model, with Pacific halibut bycatch (kg) per set (log-transformed) as the response variable. We then compared the AIC value from each model run. For continuous variables such as latitude, tree-based models (Clark and Pregion 1992) were also applied to identify stratification lines that would result in the best model fit.

For the LE primary longline sector, latitude produced the lowest AIC values among the variables tested. Results from the tree regression model supported the application of two latitudinal breaks: at 44° 36.54' N. latitude and 47° 48.33' N. latitude. While these breaks produced the lowest AIC value from our model, this AIC value was only slightly smaller than that resulting from a single latitudinal break at Point Chehalis, Washington (46° 53.30' N. lat.). Point Chehalis was used in previous estimates of Pacific halibut bycatch in the LE primary longline sector because of its relevance to groundfish management and its apparent ability to split out higher bycatch rates off the northern coast of Washington (Heery and Bellman 2009). In this analysis, we found that coefficient of variation (CV) estimates for Pacific halibut discard ratios were lower when a latitudinal break was used at Point Chehalis. CV values associated with latitudinal strata at 44° 36.54' and 47° 48.33' N. latitude were generally about 2 times larger than CV values computed using the Point Chehalis break. This is due to the smaller sample size in each stratum that results from using more than one latitudinal break.

Given these findings, we decided to maintain the same stratification in this analysis as was used previously by Heery and Bellman (2009) for the LE primary longline sector. Similar evaluations were attempted for the other fixed gear sectors to identify whether variables other than sector and gear might be appropriate as additional strata. While there was a sufficient sample size to apply additional spatial or temporal breaks in some cases, the application of these variables as strata did not improve the fit of our model to an extent that justified their use. Thus, we maintained the same stratification for the other fixed gear sectors that was used previously by Heery and Bellman (2009).

Bycatch estimation

A deterministic approach was used to estimate Pacific halibut bycatch for all sectors of the non-nearshore fixed gear fishery. Bycatch ratios were computed from observer data as the discarded weight of Pacific halibut divided by the retained weight of either sablefish or all FMP groundfish (except Pacific hake), depending on the sector (Table 10). A complete listing of groundfish species included in the Groundfish Fishery Management Plan that were used to compute and expand ratios is provided in Appendices A and B. Bycatch ratio denominators were identified for each sector of the non-nearshore fixed gear fishery based on the targeting behavior of that sector. Bycatch ratios were then multiplied by the total sector landed weight of either sablefish or FMP groundfish (except Pacific hake), corresponding with the denominator used to compute the observed discard ratio for each sector. This provided an expanded gross estimate of Pacific halibut bycatch for each sector (Table 11). A discard mortality rate (discussed below) was then applied to compute estimated total mortality.

Fish tickets with landings of sablefish using fixed gear were partitioned into the three commercial fixed-gear sectors (LE sablefish primary, LE sablefish non-primary, and OA fixed gear) through the following process. 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 sablefish sector. Next, LE fish tickets were separated based on whether the vessel's federal groundfish permit(s) had a sablefish endorsement with tier quota for the primary season or if it was not endorsed (also referred to as 'zero' tier). 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-endorsed primary sector. 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 tier quota, the fish tickets were placed in the LE sablefish non-primary sector. In addition, fish tickets from non-endorsed LE vessels were also placed in the LE sablefish non-primary sector.

Further processing of fish tickets was then conducted to identify landings from the directed Pacific halibut fishery and remove them from the non-nearshore fixed gear analysis. The directed Pacific halibut fishery occurs for only a few days each year, during 10-hour openings that are designated by the IPHC. In 2009, there were two such openings on June 24th and July 8th. LE and OA fixed gear vessels that typically target groundfish can participate in the directed fishery. For most fixed gear vessels, (other than LE primary longline vessels north of Point Chehalis) this is the only time during which they are allowed to land Pacific halibut. Fish tickets

that included Pacific halibut landings within 4 days of a directed fishery opening were considered to be part of the directed fishery and not part of the non-nearshore fixed gear fishery targeting federal FMP groundfish. These fish tickets were removed prior to our analysis. This approach may have resulted in the removal of some non-directed fishery landings north of Point Chehalis, but any bias introduced by this step is considered to be extremely small given the short time period across which fish tickets were removed. In the previous report on Pacific halibut discard in the non-nearshore fixed gear fishery, derby fish tickets were identified as those on which that largest landings came from Pacific halibut. This filtering step was applied to the area north of Point Chehalis only. Estimates from the previous report for 2002-2008 are maintained in the tables (Tables 8-12) presented here for comparison purposes.

The WCGOP observes the non-nearshore groundfish fixed gear sectors in the following order of priority: LE sablefish-endorsed primary season, the LE non-sablefish-endorsed ('0' tier) sector, and the OA fixed-gear sector. LE sablefish-endorsed vessels that fish outside of the primary season or that have reached their tier quota in the primary season are not observed. For more information see the most recent WCGOP non-nearshore fixed gear report (NWFSC 2009).

WCGOP observer data were stratified according to sector and gear type (longline and pot/trap). As discussed earlier, one additional latitudinal stratification at Point Chehalis, Washington (46° 53.30' N lat.) was used for the LE sablefish-endorsed longline sector. As was discussed earlier, some retention of Pacific halibut was allowed in the LE sablefish-endorsed primary season in the area north of Point Chehalis up until 2010, from May through the end of October of each year. The regulation allowing for Pacific halibut landings north of Point Chehalis was in place throughout the time period of data included in this report, with some slight annual differences in the weight of Pacific halibut which could be retained. This was the only latitudinal stratification incorporated into our analysis and was only applied to the LE sablefish-endorsed primary sector. Discard amounts provided for the other two fixed gear sectors represent coastwide estimates.

The number of observed trips, sets, and vessels are summarized for each sector, gear type and area (where applicable) in Table 8. Table 9 provides the landed weight of sablefish and FMP groundfish (excluding Pacific hake) used as a measure for expanding discard from observed trips to the entire fleet. Observed discard ratios (also in Table 9) were calculated by sector, gear group and area based on the following equation:

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

where:

s: strata (sector / gear group / area)

t: observed sets

d: observed discard (kg) of Pacific halibut

r: observed retained weight (mt) of sablefish or all FMP groundfish except Pacific hake

F: weight (mt) of retained sablefish or all FMP groundfish excluding Pacific hake recorded on fish tickets in strata *s*

D_s : Discard estimate for strata s

For all sector/gear/area strata, except the LE non-primary longline sector, discard ratios were calculated by dividing the stratum discard weight of Pacific halibut by the retained catch weight of sablefish. Retained groundfish was used as the ratio denominator for the LE non-primary longline sector, rather than sablefish weight alone, because this sector targets a wider range of deepwater species. A broader denominator was therefore necessary in order to effectively capture the level of fishing effort in this sector. Values provided in the tables (Tables 8-12) for this report are identical to those provided in earlier years, but with updated information for 2009. Please refer to earlier reports for further details of data pooling and discard ratios in prior years of observer coverage.

Where FMP groundfish (excluding Pacific hake) 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 by the processor under a grouped species code such as NUSP - northern unspecified slope rockfish. In some cases, this difference in species coding prevents observer and fish ticket weights from being matched and adjusted properly. Species coding on fish tickets varies considerably between processors and over time, and it is not possible to make assumptions regarding which individual observer-recorded species likely coincide with species grouping codes on fish tickets. Instead, by using only the retained groundfish weight from fish tickets in discard ratio denominators, we prevent double-counting of retained weights. This is not a factor when using a single species in the denominator, such as sablefish, as any retained weights in observer and fish ticket data that share the same species code will match and adjust properly.

In each stratum, the observed discard ratio (Table 9) was multiplied by the fish ticket retained weight of sablefish or all FMP groundfish species (excluding Pacific hake). Figure 5 demonstrates how each fishery sector/gear, expansion factor, and observed discard rate were used. This provided an expanded gross discard estimate for each stratum. If landings were made by a fixed gear sector for which there were no or very few WCGOP observations, the most appropriate observed discard ratio was selected and applied to those landings based on similarities in the fishery management structure, fishing and discard behavior, and the gear fished. The LE sablefish non-primary sector landed 18 mt of FMP groundfish with pot gear in 2009, but this portion of the fleet was not observed by the WCGOP program. Given similarities in gear type and catch composition, OA fixed gear pot observations were selected as the most appropriate source of information for an observed discard rate to apply to those landings by vessels fishing with pots in the LE sablefish non-primary sector (Figure 5).

Discard mortality rates

Once an initial gross estimate of discard had been produced, this value was multiplied by a discard mortality rate to generate a final discard mortality estimate (Table 12 and Figure 6). Ideally, discard mortality would have been approximated based on viabilities in a manner similar

to the approach used for the LE bottom trawl sector. WCGOP observers do record viability as Pacific halibut are discarded from longline vessels. However, much of the time, Pacific halibut are removed from the line before being brought onboard. This is to ensure safety, as longline vessels are often small, and to have the least possible impact on Pacific halibut survivorship. Because these fish are not typically brought onboard, the observer is not able to effectively assess viability or gain a random sample from Pacific halibut catch. Although viabilities from pot gear would be appropriate to use in estimating discard mortality, bycatch of Pacific halibut in pot gear is infrequent and the sample size of viability data from this gear type was too small to utilize in this analysis.

Pacific halibut viabilities from the non-nearshore fixed gear fishery were not used in our analysis. Discard mortality rates therefore had to be identified through other means. Review of the literature on Pacific halibut bycatch revealed little that could be applied to the entire discard estimate. Several studies have examined the survivorship of Pacific halibut in various conditions (Kaimmer and Trumble 1998, Trumble et al. 2000). However, without any information on the state of Pacific halibut that were being discarded, the findings from these examinations could not be put to use.

Instead, we relied on discard mortality rates computed for groundfish fisheries off Alaska (Williams 2008). An 18% discard mortality rate was applied to estimates for pot gear, coinciding with the DMR used for the sablefish pot CDQ fishery in Alaska. For longline gear, we used a discard mortality rate of 16%, an average of DMRs over all years for the Bering Sea/Aleutian region longline fishery (Williams 2008).

For additional context, Table 13 provides the length frequency distribution of Pacific halibut from visual estimates and actual lengths measured in the LE sablefish primary sector. Table 14 presents the proportion of sampled Pacific halibut discard in the non-nearshore fixed gear sector that was of legal (≥ 81 cm) and sublegal (< 81 cm) size. The majority of Pacific halibut lengths recorded in this fishery have been collected through visual length estimation, during which observers round to the nearest 10 cm. In other words, specimens that are 76 cm and 82 cm are both visually estimated to be 80 cm. With this level of resolution, it was not possible to compute the exact proportion of sublegal versus legal Pacific halibut from visually estimated lengths. Visual estimates were instead summarized in the manner in which they are recorded; with sublegal and legal sized halibut falling within the 75-84 cm length bin. Actual length measurements are available for 138 Pacific halibut from September 2003 through December 2009. Although sublegal versus legal percentages were computed from this data, actual length measurements do appear to contain a higher frequency of smaller individuals than visual estimates (Figure 7).

Other fishery sectors

Pacific halibut was also observed in the nearshore fixed gear sector and the pink shrimp and California halibut trawl fisheries. Bycatch estimates for these three fishery sectors were computed based on the following equation:

$$\hat{B} = \frac{\sum_t b_t}{\sum_t r_t} \times F$$

where:

- b*: observed discard (kg) of Pacific halibut on set/tow *t*
- r*: observed retained weight (mt) of target species on set/tow *t*
- F*: weight (mt) of retained target species
- B*: Bycatch estimate

The nearshore fishery targets a variety of groundfish species that inhabit areas shallower than 50 fathoms. All species included in the nearshore target group as listed in Appendix C were included in the denominator when calculating bycatch ratios for the nearshore fixed gear sector. Pink shrimp and California halibut were considered the target species in their respective fisheries.

Tables 15, 16 and 17 present the resulting bycatch estimates for the nearshore fixed gear sector, pink shrimp trawl fishery, and California halibut trawl fishery. Discard mortality rates were not applied to bycatch estimates for these fishery sectors due to a lack of information regarding survivorship. Note that the California halibut trawl fishery consists of 2 components: a limited entry sector and an open access sector. For more information regarding the differences between these 2 components, see annual data reports published by the WCGOP (www.nwfsc.noaa.gov/research/divisions/fram/observer/).

RESULTS

Limited entry bottom trawl sector

Gross bycatch estimates and total discard mortality estimates for the 2002-2009 LE bottom trawl sector are provided in Table 5. Estimated Pacific halibut discard mortality was highest in 2002 and then peaked again in 2005. Discard mortality decreased after 2005, but increased in 2009 to 251 mt. Fluctuations have occurred while trawl effort in recent years has gradually increased, from 56,016 tow hours in 2004 to 85,047 tow hours in 2009. The combination of these two factors has led to a gradual decline in mortality (kg) per tow hour since 2005, from 4.7 in 2005 to 2.8 in 2008. Mortality per tow hour increased slightly in 2009 to 3.0 kg per tow hour (Table 5). Estimates prior to 2004 for the LE bottom trawl sector were computed using viability data from 2004 through 2009, as viabilities from earlier years were not available.

In previous reports on Pacific halibut bycatch in the LE bottom trawl sector, discard was estimated based on observer, logbook, and fish ticket data from Washington and Oregon only (Wallace and Hastie, 2009). Although observer and logbook data were compiled from vessels that fished as far south as 40.667° N. latitude, only those that returned to Oregon or Washington to land their catch were included. Pacific halibut is caught in small amounts off of Northern

California by both Oregon- and California-based vessels. We therefore chose to include observer, logbook, and fish ticket data from vessels landings in California in our analysis.

Despite differences in the stratification scheme and the base dataset used in this and previous reports, discard mortality estimates were similar. Estimates from our analysis differed from those reported previously by 11 to 25%, with the greatest difference occurring in 2007. Mortality estimates presented in this report for 2005 through 2008 are higher than previously reported values (Wallace and Hastie 2009), which would be expected given the inclusion of data from California. Interestingly, in 2004, our mortality estimate for Washington, Oregon, and California combined was actually lower than previously reported estimates for Washington and Oregon only. This difference is attributed to differences in stratification. Earlier reports employed a finer level of stratification and averaged discard ratios for strata with little to no observer data records. We have not made comparisons with previous estimates for 2002 and 2003, as Wallace and Hastie (2009) used a 50% mortality rates to estimate total discard mortality in these years.

Our confidence intervals are derived from uncertainty in observer data only. The stratified random sampling design employed by the WCGOP selects vessels for coverage within each port group and bimonthly period. This approach provides the best logistical scenario for the implementation of the program and appears to achieve good spatial and temporal coverage of the fleet (Figure 2). However, this framework differs from the post-stratification scheme used in this analysis. Uncertainty estimated from post-stratified data can be biased, and should be used with caution. For this reason, and because of uncertainty that has not been accounted for in fish ticket or logbook data, the confidence intervals we provide should be considered as minimum values.

Regardless of the method used to stratify observer and logbook data or the discard mortality rate applied to gross estimates, the trend in Pacific halibut bycatch mortality in the LE bottom trawl sector is consistent. Table 6 provides the estimates resulting from 5 alternative stratification schemes. The use of state of landing instead of latitude appears to result in more extreme peaks in discard estimates. However, the differences are minimal, particularly given the size of the 95% confidence intervals for each set of estimates.

Non-nearshore fixed gear sector

Estimated discard mortality of Pacific halibut in the LE sablefish primary longline sector increased from 2008 to 2009. To some extent, this increase was associated with greater fishing effort for sablefish, both north and south of the Point Chehalis line. In total, landings from the LE sablefish primary longline sector increased to 1402 mt, compared with 1048 mt in 2008. In addition, however, the discard ratio for Pacific halibut computed from observer data for the area north of Point Chehalis was noticeably larger than in 2008 (Table 9). In other words, more Pacific halibut was discarded in relation to the amount of sablefish landed. This does not appear to be associated with any increase in the rate at which Pacific halibut was encountered. In fact, a smaller percentage of observed trips, sets, and vessels had records of Pacific halibut catch in 2009 than was typically documented in previous years (Table 10). Instead, the large discard rate seems to be best explained by the increased frequency with which vessels chose to discard this species. As mentioned previously, some retention of Pacific halibut was allowed in the LE

primary longline sector operating north of Point Chehalis. However, all Pacific halibut observed in this area in 2009 were discarded. Conversely, only 87% of the observed halibut weight was discarded in 2008 (Table 10).

While the increase in estimated discard of Pacific halibut in the LE sablefish primary longline sector thus appears to be associated changes in discard behavior among fishermen, it is also important to note that observer coverage in this sector was considerably lower in 2009. The 2009 sablefish primary season coincided with the end of a selection cycle, a period defined as the length of time required for the WCGOP to observe all vessels in the fleet. In 2009, there were a small number of vessels remaining for selection. This combined with other logistical constraints resulted in the coverage of only 9 vessels, compared with 18 in the previous year. Overall, WCGOP observed only 8.7% of the sablefish that was landed by the LE sablefish primary sector. This low level of observer coverage introduces a considerable degree of uncertainty into our final discard estimates.

Discard of Pacific halibut in other non-nearshore fixed gear sectors was mostly consistent with estimated discard amounts in previous years. Gross estimated discard in the LE primary pot sector decreased from 2008 to 2009, but remained within a range comparable to that estimated for earlier years. Among the non-primary fixed gear sectors (LE and OA), OA fixed gear vessels fishing with hook-and-line gears had the largest amount of Pacific halibut mortality. Discard mortality in this sector was 6.4 mt, compared with 6.6 mt in 2008. Effort in the OA fixed gear sector increased noticeably in 2009, with sablefish landings nearly doubling from annual landings amounts in 2007 and 2008. This did not affect discard estimates however, as the observed discard rate for Pacific halibut in 2009 was lower than in previous years (Table 9).

A large source of uncertainty in our estimates of Pacific halibut discard mortality on non-nearshore fixed gear vessels is the actual discard mortality rate applied to initial gross estimates that are computed from observer data. A small sample size of observed viability data are available from sablefish vessels fishing with pots, but not enough to be used in discard mortality estimation. Instead, we relied on findings from observed pot vessels in Alaska that assign specimens to the same condition codes used for trawl gear and then apply the discard mortality rates assumed by Williams (2008). This informed our decision to increase the discard mortality rate applied to pot estimates to 18% from 16%. As more viability information is collected by WCGOP observers from pot vessels, we intend to apply this directly to compute discard mortality in a manner consistent with methods of Williams (2008).

Just as for trawl gear, discard mortality rates have been determined experimentally for Pacific halibut caught with longline gear (Kaimmer and Trumble 1998, Trumble et al. 2000). In order to apply these rates, Pacific halibut caught on longlines are assigned to one of four condition categories (minor, moderate, severe, and dead.) based on the extent of their injuries at the time of release. Kaimmer and Trumble (1998) first derived discard mortality rates for each of these categories using mark-recapture data. Their rates were later updated by Trumble et al. (2000) to account for hook sizes that are more consistent with gear used on the West Coast for commercial purposes.

For reasons described earlier, Pacific halibut were infrequently brought onboard observed fixed gear vessels from 2002 to 2009, resulting in a small and potentially biased sample of viability data. Mortality rates specified by Trumble et al. (2000) cannot therefore be used in conjunction with these data to assess overall discard mortality. However, changes in WCGOP data collection protocol as of 2010 should allow observers to spend more of their time on fixed gear vessels collecting a random sample of Pacific halibut from which to gather viability data. These will be employed to evaluate discard mortality as soon as they become available. In the meantime, discard mortality rates of 16% for longline gear and 18% for pot gear (Williams 2008) are thought to be the best option available currently.

Other fishery sectors

Observed bycatch amounts of Pacific halibut in other fishery sectors were very small. Even without the application of discard mortality rates, bycatch estimates for the nearshore fixed gear sector, pink shrimp trawl fishery, and California halibut trawl fishery made up a minor portion of our total mortality estimate for Pacific halibut. Bycatch estimates provided in Tables 15, 16, and 17 are not intended to represent mortality values, as rates of discard mortality for these sectors are not available.

SUMMARY & CONCLUSIONS

- Estimated discard mortality in the LE bottom trawl sector fluctuated over the study period, with peaks in 2002, 2005, and 2009.
- Estimated mortality per tow hour of Pacific halibut in the LE bottom trawl sector has declined steadily since 2005.
- Discard mortality estimates were produced for the LE bottom trawl sector using data from Washington, Oregon, and California. Total annual estimates were 11 to 25% larger than previously reported estimates for 2004 through 2008 from Wallace and Hastie (2009), which were derived from Washington and Oregon data only.
- Estimated discard mortality in the LE and OA sablefish fixed gear sector fluctuated over the study period, with the largest peak of 107 mt in 2006, and smaller peak in 2009, at 56 mt.
- Within the sablefish fixed gear sector, LE sablefish primary vessels had the largest amount of Pacific halibut discard, particularly in the area north of Pt Chehalis, WA.

For a complete list of groundfish sectors, including those for which bycatch estimates are not provided in this report, see Bellman et al. (2009).

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the hard work and dedication of observers from the West Coast Groundfish Observer Program, as well as all other observer program staff. We would like to thank Gregg Williams for his feedback and guidance on several aspects of this analysis. We also thank Jim Hastie and John Wallace for their comments and Tal McGowan for his help in processing observer biological data in preparation for this report.

REFERENCES

- Bellman, M.A., E. Heery, and J. Majewski. 2009. Estimated discard and total catch of selected groundfish species in the 2008 U.S. west coast fisheries. West Coast Groundfish Observer Program. NWFSC, 2725 Montlake Blvd E., Seattle, WA 98112.
- Borges, L., Rogan, E., Officer, R., 2005a. Discarding by the demersal fishery in waters around Ireland. *Fisheries Research* 76: 1-13.
- Borges, L., Zuur, A.F., Rogan, E., Officer, R., 2005b. Choosing the best sampling unit and auxiliary variable for discard estimations. *Fisheries Research* 75: 29-39.
- Clark, L. A. and D. Pregibon. 1992. Tree-based models. *In* Chambers, J. M. and J. M. Hastie (eds). *Statistical models in S*. pp. 317-419. Wadsworth and Brooks, Pacific Grove, California.
- Clark, W.G., S. H. Hoag, R. J. Trumble, and G. H. Williams. 1992. Re-estimation of survival for trawl caught halibut released in different condition factors. *International Pacific Halibut Commission, Report of Assessment and Research Activities 1992*: 197-206.
- Clark, W. G. and S. R. Hare. 1998. Accounting for bycatch in management of the Pacific halibut fishery. *Journal of Fisheries Management* 18: 809-821.
- Cochran, W.G., 1977. *Sampling techniques*. John Wiley & Sons, New York. 155 pp.
- Heery, E. and M. Bellman. 2009. Observed and Estimated Total Discard of Pacific Halibut in the 2002-2008 U.S. West Coast Groundfish Non-Nearshore Fixed Gear Fishery. NWFSC, 2725 Montlake Blvd E., Seattle, WA 98112.
- Hoag, S. H. 1975. Survival of Halibut Released After Capture By Trawls. *International Pacific Halibut Commission, Scientific Report No. 57*, 18 p.
- Kaimmer, S. M. and R. J. Trumble. 1998. Injury, condition, and mortality of Pacific halibut bycatch following careful release of Pacific cod and sablefish longline fisheries. *Fisheries Research* 38: 131-144.
- Northwest Fisheries Science Center (NWFSC). 2006a. Observer coverage plan: Sampling plan and logistics for the West Coast Groundfish Observer Program. NOAA, West Coast Groundfish Observer Program. NWFSC, 2725 Montlake Blvd E., Seattle, WA.

Northwest Fisheries Science Center (NWFSC). 2006b. West coast groundfish observer training manual. NOAA, West Coast Groundfish Observer Program. NWFSC, 2725 Montlake Blvd E., Seattle, WA.

Northwest Fisheries Science Center (NWFSC). 2009. Data report and summary analyses of the U.S. west coast non-nearshore fixed gear groundfish fishery. West Coast Groundfish Observer Program. NWFSC, 2725 Montlake Blvd E., Seattle, WA 98112.

Pacific Fishery Management Council (PFMC). 2008. Pacific coast groundfish fishery management plan. PFMC, 7700 NE Ambassador Place, Suite 100, Portland, OR.

Pikitch, E.K., Wallace, J.R., Babcock, E.A., Erikson, D.L. Saelens, M., and G. Oddsson. 1998. Pacific halibut bycatch in the Washington, Oregon, and California groundfish and shrimp trawl fisheries. *North American Journal of Fisheries Management*. 18: 569-586.

Rochet, M-J., Trenkel, V.M., 2005. Factors for the variability of discards: assumptions and field evidence. *Canadian Journal of Fisheries and Aquatic Sciences* 62: 224-235.

Sampson, D. B. and P. R. Crone. 1997. Commercial fisheries data collection procedures for US Pacific coast groundfish. NOAA Tech. Memo. NMFS-NWFSC-31, 189 p.

Stratoudakis, Y., Fryer, R.J., Cook, R.M., Pierce, G.J., 1999. Fish discarded from Scottish demersal vessels: Estimators of total discards and annual estimates for targeted gadoids. *ICES Journal of Marine Science* 56: 592-605.

Trumble, R. J., S. M. Kaimmer, and G. H. Williams. 2000. Estimation of discard mortality rates for Pacific halibut bycatch in groundfish longline fisheries. *North American Journal of Fisheries Management* 20: 931-939.

Wallace, J. R. 2000. Unpublished report. Pacific halibut discard in the EDCP Observer program. June 2000. 18 p.

Wallace, J. and J. Hastie. 2009. Pacific halibut bycatch in IPHC area 2A in the 2008 groundfish bottom trawl fishery. NWFSC, 2725 Montlake Blvd E., Seattle, WA 98112.

Walmsley, S.A., Leslie, R.W., Saur, W.H.H., 2007. Bycatch and discarding in the South African demersal trawl fishery. *Fisheries Research* 86: 15-30.

Williams, G. H. 2008. Pacific halibut discard mortality rates in the 2006 open access and CDQ groundfish fisheries, and recommendations for discard mortality rates needed for monitoring halibut bycatch in 2008 CDQ fisheries. International Pacific Halibut Commission, Seattle, WA. 13 p.

Williams, G. H. and D. Chen. 2004. Pacific halibut discard mortality rates in the 1990-2002 Alaskan groundfish fisheries, with recommendations for monitoring in 2004. International Pacific Halibut Commission. Report of Assessment and Research Activities 2003: 227-244.

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 Fisheries Information Network (PacFIN) database. Grey highlight indicates sectors for which federal observer data is available.

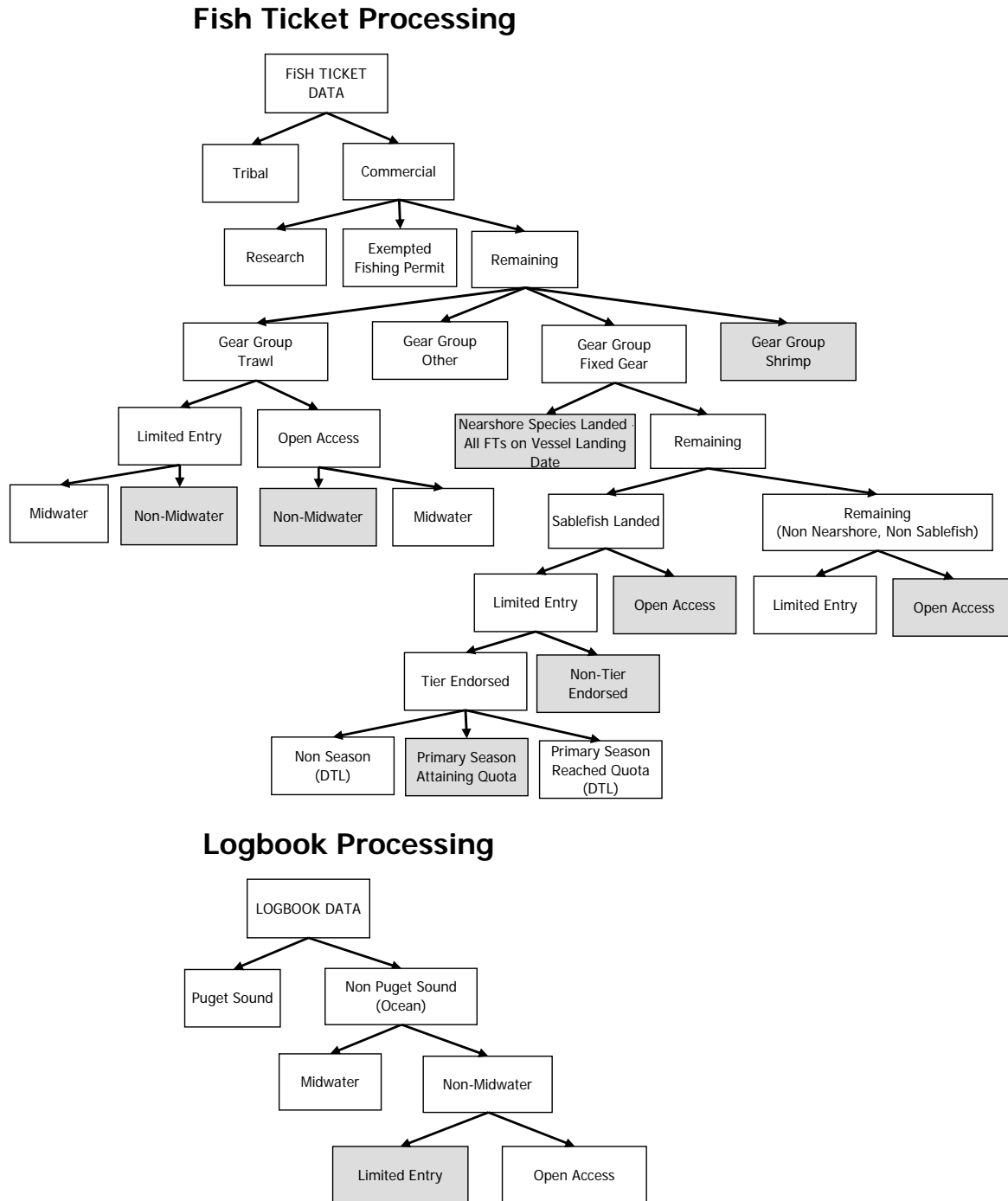


Figure 2a. Locations of observed and fleet logbook trawl tows north of Coos Bay, Oregon in 2009.

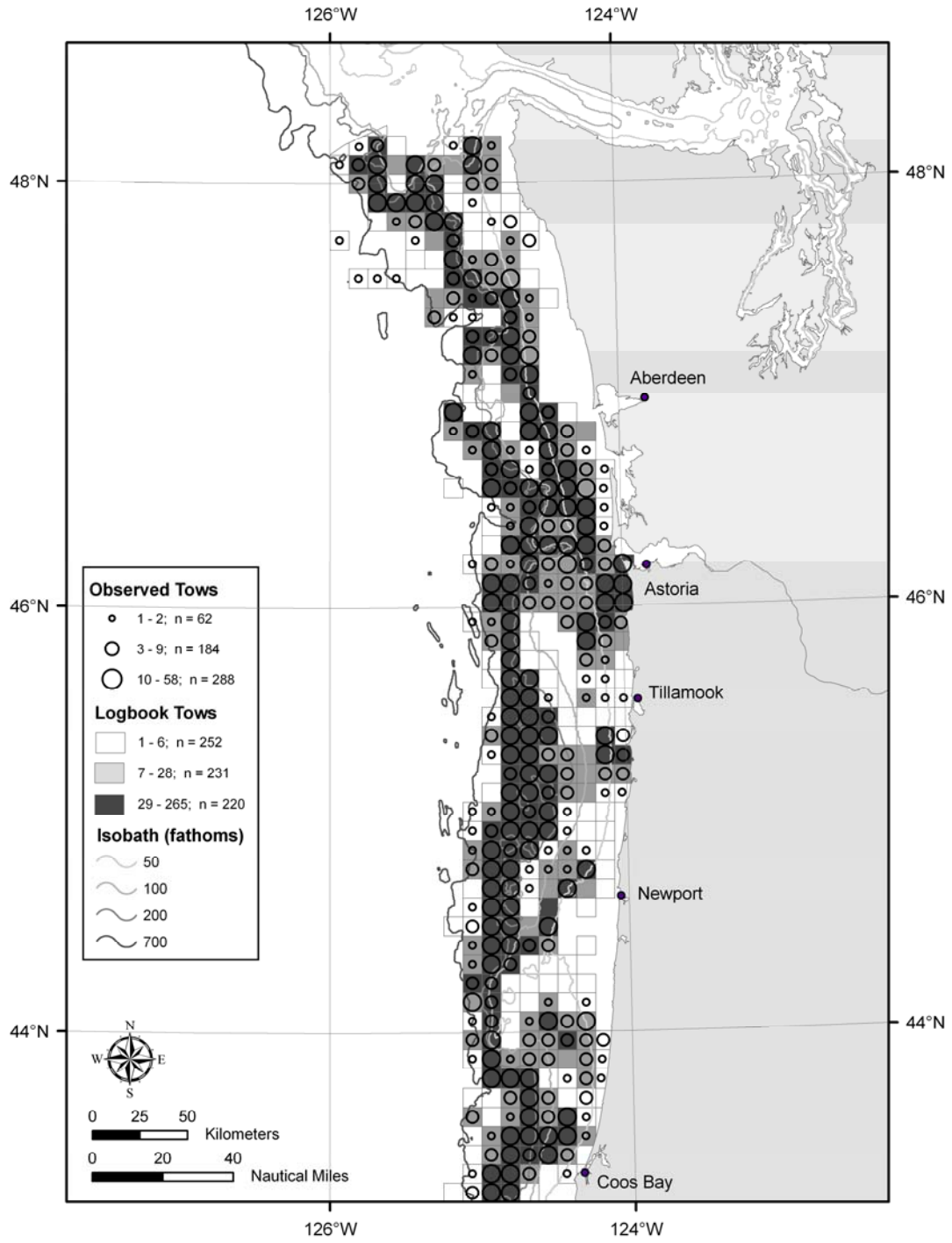


Figure 2b. Locations of observed and fleet logbook trawl tows south of Coos Bay, Oregon and north of San Francisco, California in 2009.

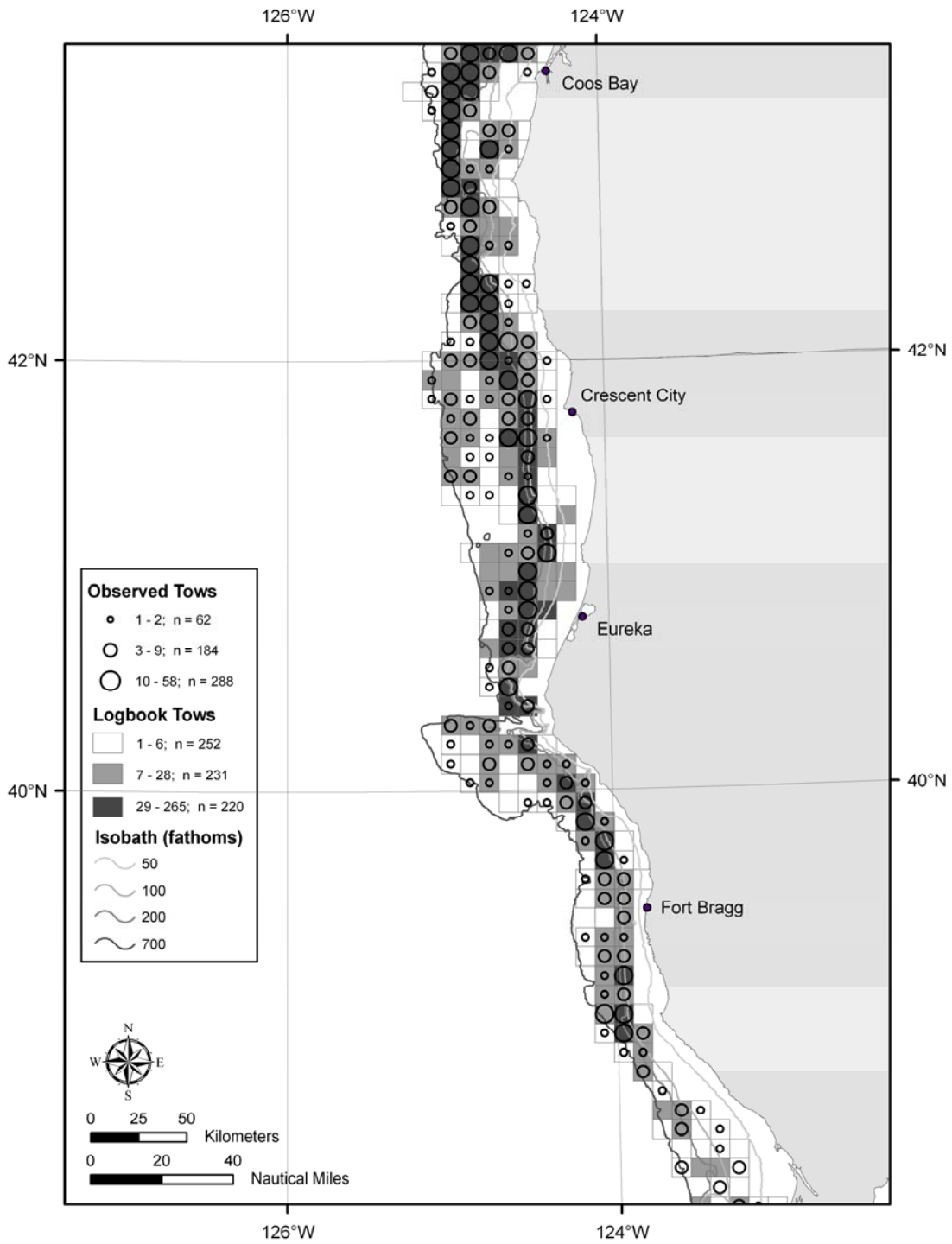


Figure 2c. Locations of observed and fleet logbook trawl tows south of San Francisco, California in 2009.

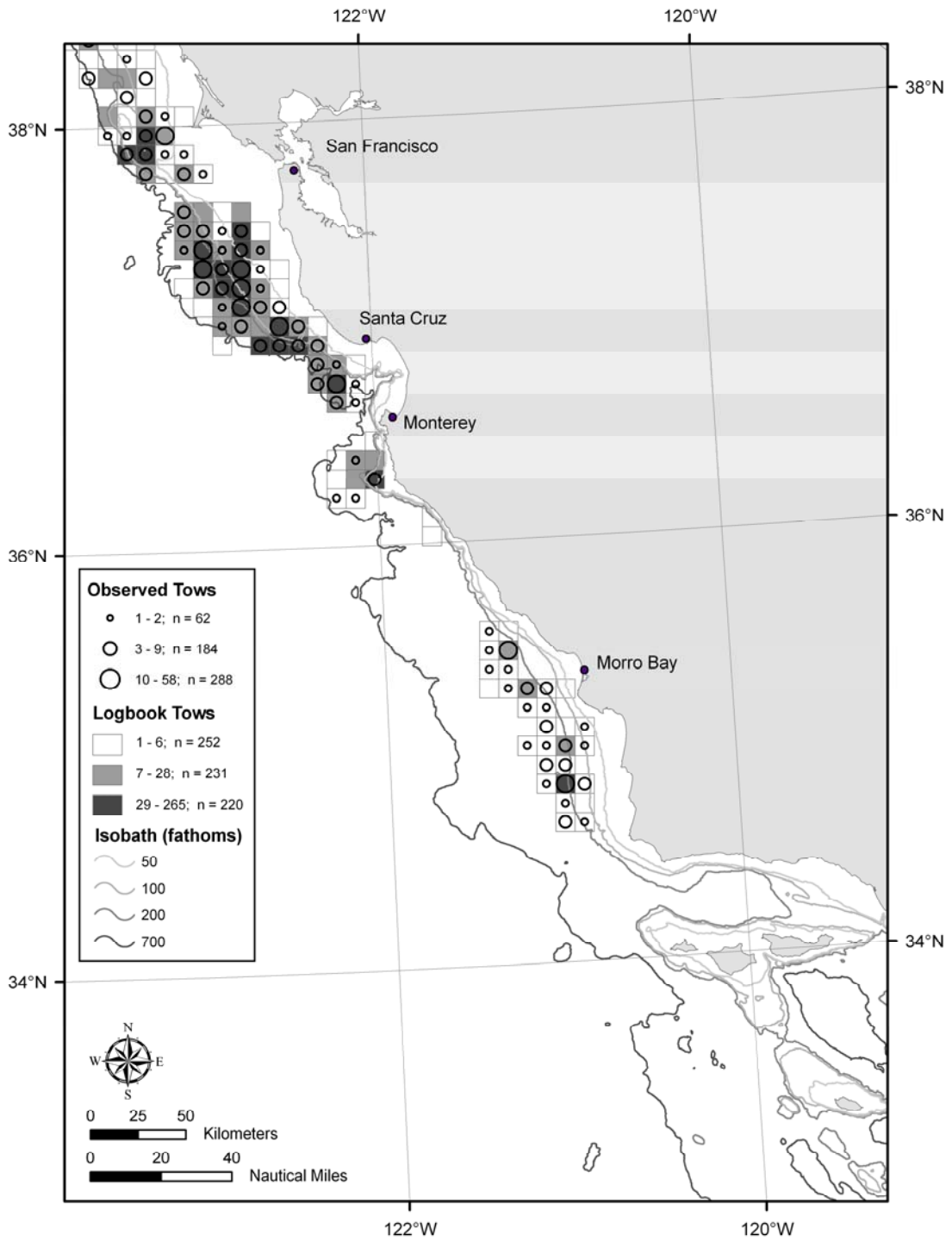


Figure 3. Log-transformed bycatch of Pacific halibut (kg) versus tow hours. A proportional relationship is not evident when including data from all areas and periods within the 2009 calendar year (a). When data from certain locations and months (b) are isolated, proportionality becomes more apparent.

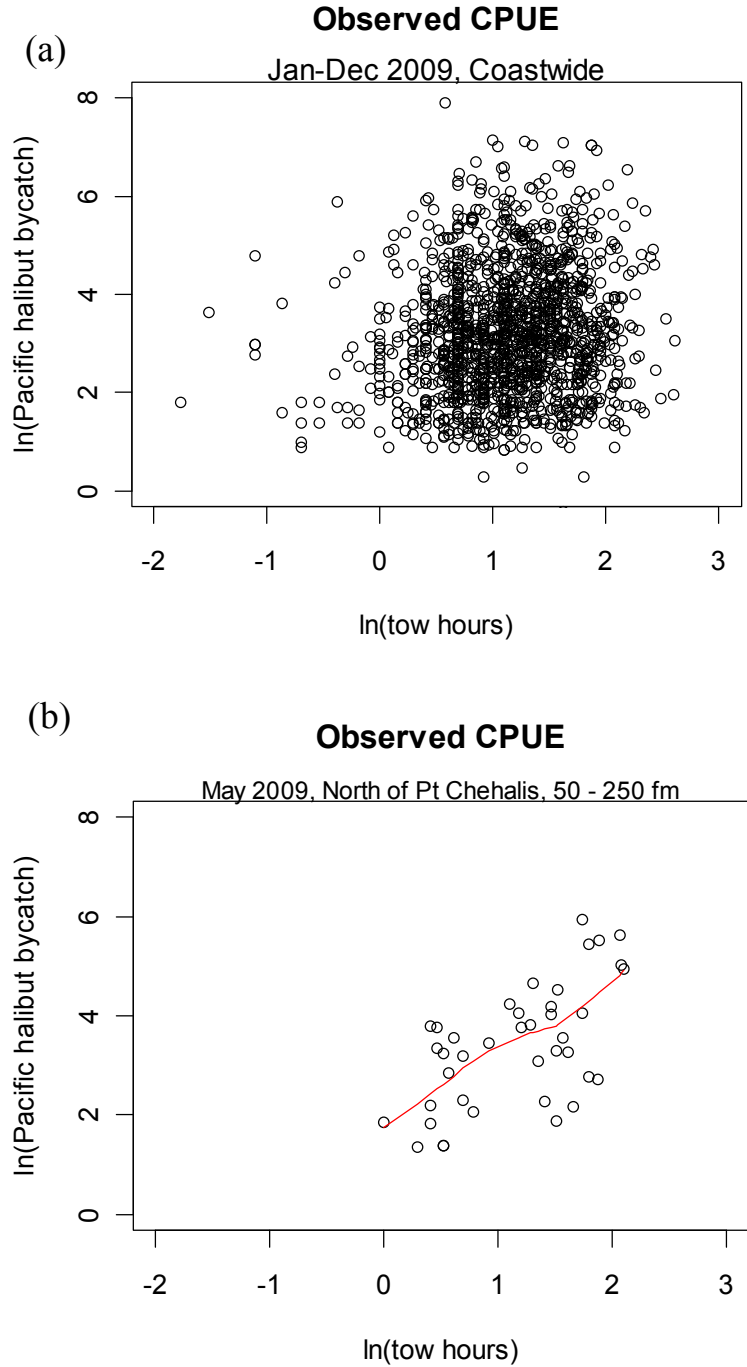


Figure 4. Tow duration (hours) versus average depth (fathoms), calculated from the depth recorded at the set and haul locations of a tow, from tows observed by the West Coast Groundfish Observer Program in the LE bottom trawl sector from 2002-2009.

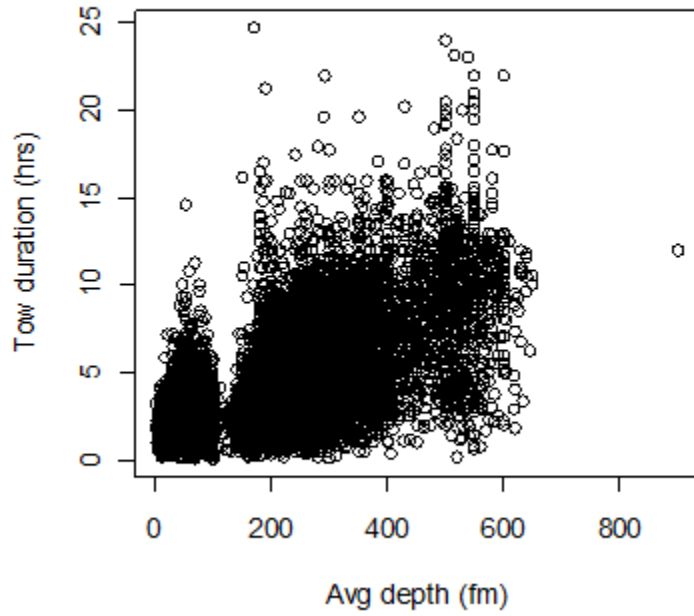


Figure 5. Expansion factors and WCGOP observed discard rate by gear type for the limited-entry (LE) and open-access (OA) non-nearshore fixed gear sectors used to expand discard estimates of Pacific halibut to the fleet-wide level.

Fishery		Expansion Factor	Observed Discard Rate Applied	
LE Sablefish Primary	Longline Pot	Retained Sablefish	LE Sablefish Primary	Longline Pot
LE Sablefish Non-Primary	Longline Pot	Retained Groundfish Retained Sablefish	LE Sablefish Non-Primary OA Fixed Gear *	Longline Pot
OA Fixed Gear	Hook-and-line Pot	Retained Sablefish	OA Fixed Gear *	Hook-and-line Pot

* No discard ratio or discard estimate was computed in the OA fixed gear sector for 2002-2006 because the WCGOP only covered OA vessels in California during this time.

Figure 6. Estimated discard mortality of Pacific halibut in the non-nearshore groundfish fixed gear fishery. Estimates are presented for fixed gear sectors with annual discard estimates exceeding 1 mt, which included all components of the limited entry (LE) sablefish primary sector (longline gear (LL) by area and pot gear (POT) coastwide) and the open access (OA) sector using hook-and-line gears. The OA fixed gear sector was only observed in California from 2003-2006 and was not covered in 2002. A fixed average discard rate from 2007 and 2008 data was applied to generate 2002-2006 discard estimates for the OA sector. Although OA 2002-2006 discard estimates are not included in final total mortality summaries, they are shown here for comparison purposes.

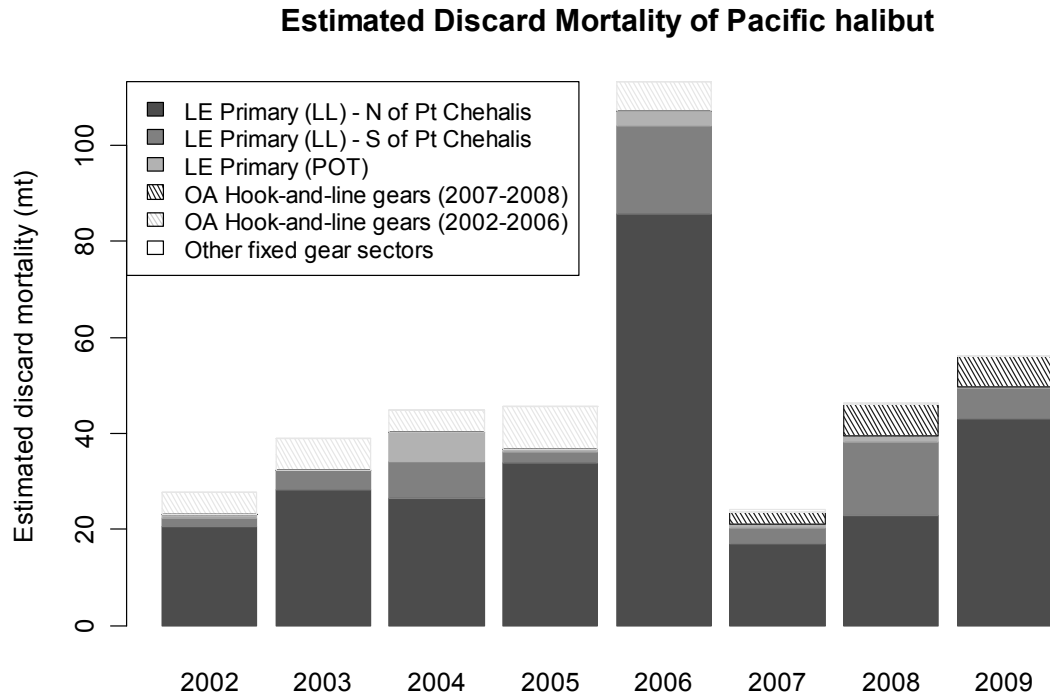
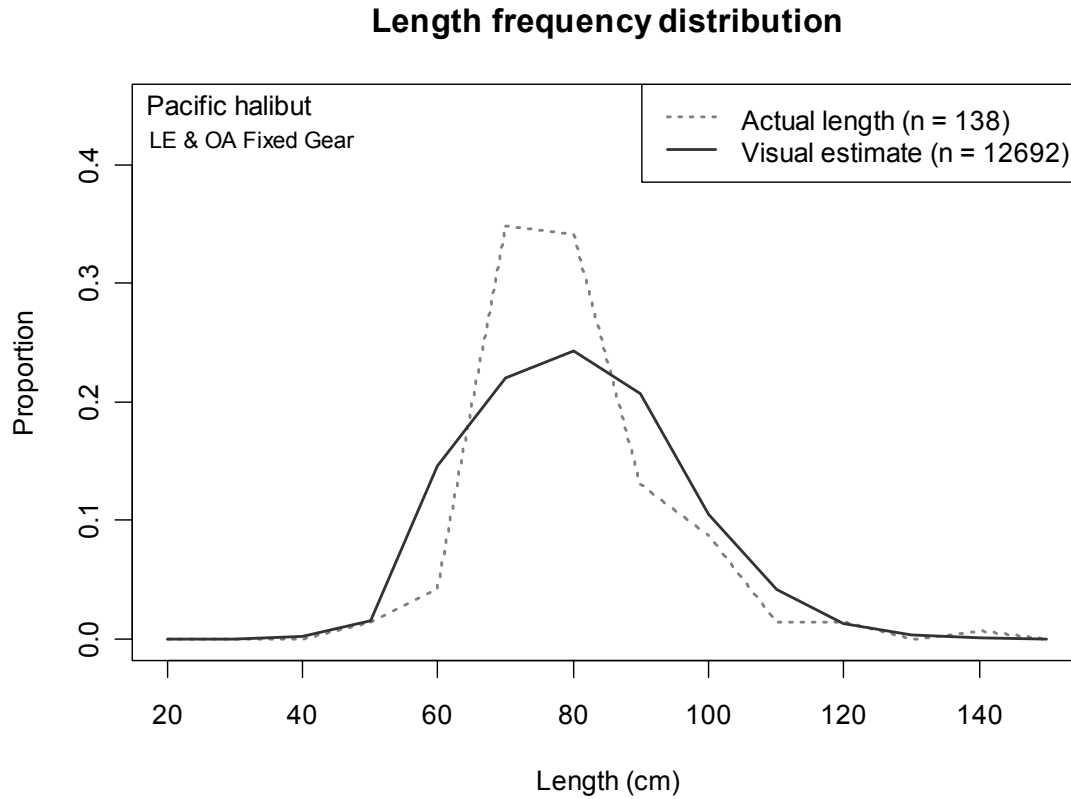


Figure 7. Length frequency distribution of discarded Pacific halibut on WCGOP observed limited entry (LE) and open access (OA) groundfish fixed gear vessels from September 2003 through December 2009. The majority of Pacific halibut lengths collected in this fishery were visual estimates (solid dark line). Actual length measurements (dashed gray line) were only available for 138 fish.



TABLES

Table 1. Observed trips, tows, vessels, Pacific halibut discard (kg), and tow hours in the LE bottom trawl sector. Data are provided for each year, area, and depth strata used in our analysis. Total fleet tow hours and the percentage of tow hours that were observed are presented on the far right, based on trawl logbook data from the PacFIN regional database. Note that Point Chehalis is located at 46° 53.30' N. lat.

	Num. of observed trips	Num. of observed tows	Num. of observed vessels	Observed Pacific halibut discard (kg)	Observed tow hours	Vessel logbook total tow hours*	% of tow hours observed
North of Pt Chehalis							
0 to 60 fm							
2002	102	341	15	5,818	592	2,934	20%
2003	20	80	7	412	199	1,527	13%
2004	98	307	13	6,969	604	3,539	17%
2005	62	234	16	5,380	451	2,559	18%
2006	73	197	14	4,400	411	3,044	14%
2007	26	114	6	3,261	254	1,965	13%
2008	12	124	3	2,320	373	1,345	28%
2009	19	138	10	4,931	271	967	28%
> 60 fm							
2002	110	443	25	41,165	1,623	13,766	12%
2003	59	299	23	11,188	1,318	10,521	13%
2004	94	397	21	22,851	1,256	5,862	21%
2005	134	778	31	64,433	2,157	9,465	23%
2006	96	417	21	36,897	1,330	7,177	19%
2007	42	281	15	14,872	1,223	7,446	16%
2008	54	459	24	35,271	2,328	10,962	21%
2009	68	526	25	42,739	2,475	11,055	22%
South of Pt Chehalis							
0 to 60 fm							
2002	110	609	34	4,226	1,208	8,394	14%
2003	91	279	25	575	566	6,615	9%
2004	125	812	28	3,286	1,536	7,417	21%
2005	132	622	35	8,141	1,603	8,590	19%
2006	118	678	28	12,902	1,640	9,568	17%
2007	72	406	21	8,934	1,131	7,678	15%
2008	61	321	15	1,798	726	4,278	17%
2009	88	616	21	11,412	1,511	5,152	29%
> 60 fm							
2002	378	1734	118	7,753	9,988	70,012	14%
2003	334	1625	104	8,293	9,388	58,480	16%
2004	390	1914	90	10,909	10,394	39,198	27%
2005	354	1808	89	24,016	8,297	39,770	21%
2006	330	1680	73	18,225	8,054	40,687	20%
2007	297	1707	81	18,017	8,758	46,857	19%
2008	376	2281	92	25,351	11,577	58,751	20%
2009	517	3098	95	32,303	15,285	67,873	23%

* Vessel logbook total tow hours have been adjusted based on the total fish ticket landings of

Table 2. Observed discard ratios (kg/hr) and estimated gross discard (kg) for Pacific halibut in each of the area, depth, and CPUE strata used in our analysis for the LE bottom trawl sector. “Correlating species” includes arrowtooth flounder, petrale sole, lingcod, Pacific cod, skates, yellowtail rockfish, and Pacific ocean perch. Confidence intervals were estimated based on uncertainty in observer data only.

0 to 60 fathoms						> 60 fathoms				
Observed			Estimated			Observed		Estimated		
Discard ratio (kg/hr)	SE	Gross discard estimate (kg)	95% CI lower	95% CI upper	Discard ratio (kg/hr)	SE	Gross discard estimate (kg)	95% CI lower	95% CI upper	
										North of Pt Chehalis
≤ 125 lbs/hr correlating species										
2002	6.85	0.99	6,261	4,483	8,040	5.62	0.89	32,795	22,586	43,004
2003	1.04	0.40	364	87	640	1.40	0.56	7,354	1,608	13,100
2004	6.49	1.61	5,235	2,682	7,788	1.34	0.29	3,457	1,979	4,935
2005	9.75	2.90	5,566	2,325	8,808	12.59	6.94	42,483	0	88,428
2006	7.84	1.64	9,254	5,453	13,054	5.16	1.06	17,259	10,327	24,190
2007	11.72	3.56	10,868	4,401	17,335	3.35	1.47	14,420	2,041	26,799
2008	2.35	0.66	953	428	1,478	1.18	0.20	8,139	5,432	10,846
2009	7.42	1.50	2,222	1,340	3,104	3.31	0.62	21,963	13,846	30,079
> 125 lbs/hr correlating species										
2002	10.88	1.05	21,973	17,808	26,138	46.28	5.97	367,146	274,388	459,904
2003	2.55	0.70	3,003	1,388	4,617	20.65	3.40	109,201	73,947	144,455
2004	12.54	1.55	34,254	25,944	42,564	32.46	4.75	106,598	76,023	137,173
2005	12.48	1.64	24,818	18,433	31,204	38.88	3.39	236,715	196,312	277,117
2006	12.34	1.49	23,006	17,566	28,447	45.08	6.66	172,672	122,674	222,669
2007	14.33	5.30	14,865	4,090	25,641	28.03	6.33	88,142	49,137	127,147
2008	7.92	1.52	7,428	4,628	10,229	35.53	5.33	145,011	102,366	187,656
2009	22.15	3.94	14,796	9,634	19,958	38.71	4.42	171,175	132,907	209,443
South of Pt Chehalis										
≤ 125 lbs/hr correlating species										
2002	3.91	0.77	22,477	13,751	31,203	0.44	0.08	26,125	17,061	35,190
2003	0.32	0.16	1,378	14	2,741	0.20	0.04	9,287	6,016	12,558
2004	1.10	0.20	4,205	2,743	5,668	0.28	0.04	8,411	5,942	10,881
2005	2.78	0.39	8,645	6,240	11,049	0.35	0.06	9,438	6,333	12,543
2006	1.34	0.22	5,333	3,641	7,024	0.27	0.04	7,483	5,384	9,583
2007	3.70	0.72	14,082	8,728	19,436	0.47	0.06	15,392	11,234	19,550
2008	1.21	0.27	2,318	1,303	3,334	0.92	0.20	39,272	22,436	56,108
2009	2.63	0.32	7,680	5,828	9,532	0.84	0.11	46,433	34,095	58,770
> 125 lbs/hr correlating species										
2002	2.95	0.39	7,799	5,770	9,828	4.00	0.52	39,837	29,604	50,070
2003	1.91	0.51	4,477	2,122	6,833	4.59	0.48	51,592	41,072	62,112
2004	3.28	0.54	11,841	8,005	15,678	4.16	0.51	38,425	29,266	47,584
2005	6.18	0.74	33,875	25,937	41,814	7.58	0.78	98,808	78,787	118,829
2006	13.50	1.97	75,235	53,665	96,804	6.13	0.70	80,668	62,579	98,756
2007	11.77	1.37	45,573	35,200	55,947	6.56	0.60	91,034	74,717	107,350
2008	3.83	0.63	9,030	6,120	11,941	5.80	0.78	93,055	68,584	117,526
2009	11.83	1.34	26,412	20,557	32,267	7.43	0.89	94,555	72,439	116,672

Table 3. Summary of Pacific halibut viability data collected by observers in each year and depth stratum in the LE bottom trawl sector. The condition of sampled Pacific halibut was identified as Excellent (Exc), Poor, or Dead based on the injury key presented in Appendix L of the WCGOP training manual (NWFSC 2006b), which is consistent with IPHC protocol. The number in each category was weighted based on the length weight relationship as described in the Methods.

	Number				Weighted average percentages in each category		
	Exc	Poor	Dead	Total	Exc	Poor	Dead
2004							
0 to 60 fm	397	208	229	834	52%	25%	23%
> 60 fm	168	181	641	990	20%	20%	60%
2005							
0 to 60 fm	267	208	405	880	35%	21%	44%
> 60 fm	777	808	1647	3232	27%	23%	50%
2006							
0 to 60 fm	424	189	333	946	54%	18%	28%
> 60 fm	237	157	609	1003	23%	15%	62%
2007							
0 to 60 fm	251	89	444	784	38%	12%	50%
> 60 fm	154	125	862	1141	15%	11%	74%
2008							
0 to 60 fm	32	61	179	272	12%	22%	65%
> 60 fm	490	343	1433	2266	24%	16%	60%
2009							
0 to 60 fm	446	221	367	1034	44%	20%	36%
> 60 fm	594	394	1635	2623	25%	15%	60%
All years (US							
0 to 60 fm	1817	976	1957	4750	43%	20%	37%
> 60 fm	2420	2008	6827	11255	24%	17%	59%

Table 4. Gross discard (kg), and discard mortality (kg) of Pacific halibut estimated for each depth stratum and year in the LE bottom trawl sector. Estimates were allocated to the three condition categories based on information presented in Table 3.

	Estimated Gross Discard (kg)				Estimated Discard Mortality (kg)				DMR
	Exc	Poor	Dead	Total	<i>m(Exc)</i>	<i>m(Poor)</i>	<i>m(Dead)</i>	<i>m(Total)</i>	
0 to 60 fm									
2002	25,270	11,727	21,513	58,510	5,054	6,450	19,362	30,866	53%
2003	3,982	1,848	3,390	9,221	796	1,017	3,051	4,864	53%
2004	29,022	13,904	12,609	55,535	5,804	7,647	11,348	24,800	45%
2005	25,230	15,585	32,090	72,905	5,046	8,572	28,881	42,499	58%
2006	60,767	20,850	31,210	112,827	12,153	11,467	28,089	51,710	46%
2007	32,090	10,211	43,087	85,388	6,418	5,616	38,778	50,812	60%
2008	2,383	4,434	12,913	19,730	477	2,439	11,621	14,537	74%
2009	22,334	10,463	18,313	51,110	4,467	5,755	16,482	26,704	52%
> 60 fm									
2002	109,897	81,222	274,785	465,903	21,979	44,672	247,306	313,958	67%
2003	41,853	30,932	104,648	177,434	8,371	17,013	94,184	119,567	67%
2004	31,665	30,616	94,610	156,891	6,333	16,839	85,149	108,321	69%
2005	104,172	90,731	192,541	387,443	20,834	49,902	173,286	244,023	63%
2006	64,401	41,243	172,437	278,081	12,880	22,684	155,194	190,757	69%
2007	31,333	23,298	154,355	208,987	6,267	12,814	138,920	158,000	76%
2008	67,929	46,002	171,546	285,476	13,586	25,301	154,391	193,278	68%
2009	84,101	49,849	200,175	334,126	16,820	27,417	180,158	224,395	67%

Table 5. Total fleet-wide trawl effort (hours), estimated Pacific halibut bycatch (mt), estimated Pacific halibut discard mortality (mt), and mortality (kg) per tow hour in the LE bottom trawl sector from 2002 to 2009.

Trawl effort (hours)	Total bycatch (mt)				Total discard mortality (mt)				Mortality (kg) per tow hour
	Estimate	95% confidence interval		Estimate	95% confidence interval				
		lower	upper		lower	upper			
2002	95,106	524	(385, 663)	345	(254, 436)	3.6			
2003	77,143	187	(126, 247)	124	(85, 164)	1.6			
2004	56,016	212	(153, 272)	133	(96, 170)	2.4			
2005	60,384	460	(334, 590)	287	(208, 367)	4.7			
2006	60,476	391	(281, 501)	242	(175, 310)	4.0			
2007	63,946	294	(190, 399)	209	(135, 283)	3.3			
2008	75,336	305	(211, 399)	208	(144, 272)	2.8			
2009	85,047	385	(291, 480)	251	(190, 313)	3.0			

Table 6. Pacific halibut bycatch (lb, net), mortality (lb, net), and mortality (lb) per trawl hour in the LE bottom trawl sector resulting from various stratification alternatives. We produced estimates using three different stratification schemes for observer and logbook data, which are detailed in the far left column. Two alternative stratification approaches were also considered when analyzing viability data, as noted in the second column. The first set of values provided, with 2 depths, 2 areas, 2 CPUE strata, and depth only as a means for stratifying viability data, coincide with our final estimates in Table 5. Values are provided in net lbs in order to provide easy comparison to estimates from Wallace and Hastie (2009). Note that 1 kg (round weight) = 1.65375 lbs (net weight).

Stratification of observer and logbook data	Stratification of viability data	Year	Trawl effort (hrs)	Bycatch (lb, net)			Mortality (lb, net)			Mortality (lb) per trawl hour
				est	Lower bound	Upper bound	est	Lower bound	Upper bound	
2 depths (60 fm) 2 areas (Pt Chehalis) 2 CPUE strata (125lbs/hr) *	depth only	2002	95,106	867,249	637,439	1,097,059	570,252	419,432	721,072	6.0
		2003	77,143	308,680	208,791	408,570	205,778	139,824	271,733	2.7
		2004	56,016	351,300	252,336	450,265	220,149	158,339	281,959	3.9
		2005	60,384	761,300	552,957	975,369	473,835	344,163	607,112	7.8
		2006	60,476	646,465	465,181	827,749	400,981	288,861	513,100	6.6
		2007	63,946	486,823	313,463	660,183	345,324	223,035	467,613	5.4
		2008	75,336	504,735	349,431	660,039	343,673	237,810	449,537	4.6
	2009	85,047	637,084	480,657	793,512	415,254	313,591	516,918	4.9	
	depth & area	2002	95,106	867,249	637,439	1,097,059	571,112	420,151	722,074	6.0
		2003	77,143	308,680	208,791	408,570	205,908	139,906	271,909	2.7
		2004	56,016	351,300	252,336	450,265	207,435	149,351	265,518	3.7
		2005	60,384	761,300	552,957	975,369	463,083	337,007	592,586	7.7
		2006	60,476	646,465	465,181	827,749	408,952	294,308	523,596	6.8
		2007	63,946	486,823	313,463	660,183	339,387	221,892	456,882	5.3
2008		75,336	504,735	349,431	660,039	347,423	240,515	454,332	4.6	
2009	85,047	637,084	480,657	793,512	427,362	322,256	532,467	5.0		
2 depths (60 fm) 2 areas (Pt Chehalis)	depth only	2002	95,106	763,502	585,336	941,668	500,414	383,388	617,439	5.3
		2003	77,143	249,458	179,631	319,285	165,710	119,787	211,633	2.1
		2004	56,016	338,115	251,974	424,255	210,584	156,462	264,706	3.8
		2005	60,384	780,600	616,744	944,456	485,891	383,925	587,856	8.0
		2006	60,476	659,735	493,013	826,457	411,964	307,785	516,144	6.8
		2007	63,946	451,157	325,528	576,786	318,223	229,605	406,841	5.0
		2008	75,336	518,820	381,150	656,490	353,132	259,363	446,902	4.7
	2009	85,047	646,293	514,508	778,078	420,111	334,846	505,376	4.9	
	depth & area	2002	95,106	763,502	585,336	941,668	501,246	384,093	618,399	5.3
		2003	77,143	249,458	179,631	319,285	165,792	119,840	211,743	2.1
		2004	56,016	338,115	251,974	424,255	198,048	147,533	248,562	3.5
		2005	60,384	780,600	616,744	944,456	475,219	375,699	574,739	7.9
		2006	60,476	659,735	493,013	826,457	420,065	313,218	526,911	6.9
		2007	63,946	451,157	325,528	576,786	312,506	227,098	397,914	4.9
2008		75,336	518,820	381,150	656,490	357,648	262,342	452,953	4.7	
2009	85,047	646,293	514,508	778,078	431,344	342,980	519,709	5.1		
2 depths (60 fm) by state (WA, OR, CA)	depth only	2002	95,106	800,798	582,613	1,018,983	526,039	382,525	669,554	5.5
		2003	77,143	229,817	149,752	309,881	152,157	99,825	204,489	2.0
		2004	56,016	257,856	188,863	326,850	160,222	117,631	202,812	2.9
		2005	60,384	819,617	628,552	1,010,682	510,200	391,366	629,034	8.4
		2006	60,476	627,591	457,072	798,109	391,228	285,046	497,410	6.5
		2007	63,946	443,613	306,848	580,378	313,756	216,075	411,438	4.9
		2008	75,336	578,736	406,997	751,516	393,419	276,574	511,032	5.2
2009	85,047	605,068	463,631	746,506	389,973	299,734	480,212	4.6		

Table 7. Pacific halibut length frequencies collected by WCGOP observers during 2009 in the LE bottom trawl sector. The upper limits on the length intervals are inclusive, while the lower limits are not.

Length interval (cm)	Length freq.	Percent length freq.
25-30	0	0.00
30-35	0	0.00
35-40	0	0.00
40-45	0	0.00
45-50	0	0.00
50-55	1	0.00
55-60	18	0.01
60-65	104	0.07
65-70	242	0.16
70-75	321	0.21
75-80	294	0.19
80-85	194	0.13
85-90	149	0.10
90-95	90	0.06
95-100	51	0.03
100-105	34	0.02
105-110	12	0.01
110-115	8	0.01
115-120	3	0.00
120-125	3	0.00
125-130	2	0.00
130-135	0	0.00
135-140	0	0.00
140-145	0	0.00
145-150	0	0.00
150-155	0	0.00
155-160	0	0.00
160-165	0	0.00
165-170	0	0.00
170-175	0	0.00
175-180	0	0.00
180-185	0	0.00

Table 8. Number of observed trips, sets, and vessels in the limited-entry (LE) sablefish primary, LE sablefish non-primary, and open-access (OA) fixed gear sectors annually by the West Coast Groundfish Observer Program.

	LE Sablefish Primary			LE Sablefish Non-Primary	OA Fixed Gear	
	Longline		Pot	Longline	Hook-and-line Gears	Pot
	North of Pt Chehalis	South of Pt Chehalis				
Number of observed trips						
2002	23	47	23	11	0	0
2003	25	25	35	130	41	16
2004	13	35	13	62	43	96
2005	31	73	39	35	34	43
2006	31	34	39	121	11	38
2007	36	40	30	158	50	45
2008	17	60	24	122	58	55
2009	13	34	27	138	68	30
Number of observed sets						
2002	207	181	247	22	0	0
2003	191	158	362	219	49	50
2004	115	205	139	130	53	182
2005	388	275	491	60	37	50
2006	291	159	288	196	12	39
2007	381	136	154	303	66	72
2008	194	345	329	220	68	74
2009	178	109	67	271	101	45
Number of observed vessels						
2002	9	18	6	4	0	0
2003	8	8	6	17	13	7
2004	6	13	3	14	15	17
2005	10	18	7	11	10	14
2006	9	10	7	21	8	15
2007	9	14	4	36	25	20
2008	6	13	6	32	33	20
2009	4	6	3	34	33	18

Table 9. Total sablefish and FMP groundfish landings (except Pacific hake) (mt) and observed Pacific halibut discard ratios for each sector and gear type in the non-nearshore fixed gear fishery. Sablefish landings were used as the discard ratio denominator and expansion factor in all cases except for the limited-entry (LE) sablefish non-primary sector, where target species include a variety of deepwater groundfish species.

	LE Sablefish Primary			LE Sablefish Non-Primary		OA Fixed Gear	
	Longline		Pot	Longline	Pot	Hook-and-Line Gears	Pot
	North of Pt Chehalis	South of Pt Chehalis					
Expansion factor				<i>Groundfish</i>	<i>Sablefish</i>		
Total fleet landings <i>(Based on fish tickets)</i>	<i>Sablefish landings (mt)</i>			<i>landings (mt)</i>	<i>landings (mt)</i>	<i>Sablefish landings (mt)</i>	
2002	390	407	354	452	6	266	109
2003	499	569	604	485	7	375	187
2004	698	654	626	377	6	272	182
2005	641	676	615	519	7	518	374
2006	684	708	611	441	4	347	435
2007	489	607	426	462	9	203	244
2008	385	663	421	652	18	326	235
2009	418	984	487	695	18	580	358
Observed Pacific halibut discard ratios							
2002	0.3297	0.0283	0.0114	0.0000	*	*	*
2003	0.3532	0.0467	0.0005	0.0003	*	*	*
2004	0.2369	0.0746	0.0526	0.0000	*	*	*
2005	0.3318	0.0204	0.0043	0.0000	*	*	*
2006	0.7827	0.1636	0.0271	0.0000	*	*	*
2007	0.2184	0.0334	0.0092	0.0032	(0.0035)	0.0839	0.0035
2008	0.3715	0.1453	0.0151	0.0041	(0.0010)	0.1259	0.0010
2009	0.6436	0.0413	0.0017	0.0003	(0.0007)	0.0684	0.0007

* No discard ratio is provided for the OA fixed gear sector for 2002-2006 because the WCGOP only covered OA vessels in California during this time. Since 2007-2008 OA pot discard rates were used to estimate LE non-endorsed discard, discard ratios for this sector were also excluded.

Table 10. Summary of the percent of observed trips that caught Pacific halibut by sector, gear, and area (where applicable). Observed average, minimum and maximum annual catch and annual discard weights of Pacific halibut are also provided, along with the percent of Pacific halibut catch weight that was discarded by year.

	LE Sablefish Primary			LE Sablefish Non-Primary		OA Fixed Gear	
	Longline		Pot	Longline	Pot	Hook-and-Line Gears	Pot
	North of Pt Chehalis	South of Pt Chehalis					
% of observed trips that caught Pacific halibut							
2002	95.7%	46.8%	17.4%	0.0%	--	--	--
2003	100.0%	52.0%	8.6%	0.8%	--	0.0%	0.0%
2004	100.0%	71.4%	38.5%	0.0%	--	0.0%	0.0%
2005	96.8%	58.9%	33.3%	0.0%	--	0.0%	0.0%
2006	100.0%	76.5%	56.4%	0.0%	--	9.1%	0.0%
2007	94.4%	47.5%	33.3%	1.9%	--	26.0%	6.7%
2008	100.0%	78.3%	83.3%	3.3%	--	34.5%	5.5%
2009	84.6%	35.3%	33.3%	0.7%	--	38.2%	10.0%
Observed annual catch (mt) of Pacific halibut							
Mean	51.5	11.6	2.1	0.1	--	0.9	0.0
Min	12.1	2.3	0.1	0.0	--	0.1	0.0
Max	117.2	36.6	5.4	0.1	--	1.6	0.0
Observed annual discard (mt) of Pacific halibut							
Mean	45.0	11.5	2.1	0.1	--	0.9	0.0
Min	9.5	2.3	0.1	0.0	--	0.1	0.0
Max	109.6	36.6	5.4	0.1	--	1.6	0.0
% of Pacific halibut catch that was discarded							
2002	80.1%	95.5%	100.0%	*	--	--	--
2003	82.5%	99.5%	100.0%	100.0%	--	*	*
2004	79.0%	97.7%	100.0%	*	--	*	*
2005	84.8%	100.0%	100.0%	*	--	*	*
2006	93.5%	97.9%	100.0%	*	--	100.0%	*
2007	80.6%	100.0%	100.0%	100.0%	--	100.0%	100.0%
2008	87.4%	100.0%	100.0%	100.0%	--	100.0%	100.0%
2009	100.0%	100.0%	100.0%	100.0%	--	100.0%	100.0%

* No catch of Pacific halibut was observed, and thus a % discarded calculation is not possible.

-- No WCGOP observations were made for the year/sector/gear type.

Table 11. Estimated gross discard (mt) and discard mortality (mt) of Pacific halibut in the limited entry (LE) sablefish primary, LE sablefish non-primary, and open access (OA) fixed gear sectors. Estimated discard mortality was computed by applying a 16% discard mortality rate to gross discard estimates for hook-and-line gears. An 18% discard mortality rate was applied to pot gear estimates. Discard estimates were not initially computed for the 2002-2006 OA fixed gear sector because the WCGOP only observed OA fixed gear vessels off of California during that time. In a previous report (Heery and Bellman 2009), potential values for these years were produced by applying a combined discard rate from 2007-2008 to 2002-2006 landings data. The results using this assumed 2007-2008 rate are shown in brackets.

	2002	2003	2004	2005	2006	2007	2008	2009
LE Sablefish Primary (mt)								
Longline								
<u>North of Pt Chehalis</u>								
Gross discard estimate	128.7	176.2	165.3	212.6	535.5	106.8	143.2	268.8
Estimated discard mortality (16%)	20.6	28.2	26.5	34.0	85.7	17.1	22.9	43.0
<u>South of Pt Chehalis</u>								
Gross discard estimate	11.5	26.6	48.7	13.8	115.9	20.3	96.3	40.7
Estimated discard mortality (16%)	1.8	4.3	7.8	2.2	18.5	3.2	15.4	6.5
<u>Coastwide</u>								
Gross discard estimate	140.2	202.7	214.1	226.4	651.4	127.1	239.5	309.4
Estimated discard mortality (16%)	22.4	32.4	34.3	36.2	104.2	20.3	38.3	49.5
Pot								
<u>Coastwide</u>								
Gross discard estimate	4.1	0.3	33.0	2.6	16.5	3.9	6.4	0.8
Estimated discard mortality (18%)	0.7	0.1	5.9	0.5	3.0	0.7	1.1	0.2
LE Sablefish Non-Primary (mt)								
Longline								
<u>Coastwide</u>								
Gross discard estimate	0.0	0.1	0.0	0.0	0.0	1.5	2.6	0.2
Estimated discard mortality (16%)	0.0	0.0	0.0	0.0	0.0	0.2	0.4	0.0
Pot								
<u>Coastwide</u>								
Gross discard estimate	*	*	*	*	*	0.03	0.02	0.01
<i>Assuming OA fixed gear 07-08 pot discard rate for 2002 - 2006 *</i>								
Estimated discard mortality (18%)	[0.0]	[0.0]	[0.0]	[0.0]	[0.0]			
	*	*	*	*	*	0.0	0.0	0.0
OA Fixed Gear (mt)								
Hook-and-line Gears								
<u>Coastwide</u>								
Gross discard estimate						17.0	41.1	39.7
<i>Assuming 07-08 discard rate for 2002 - 2006</i>								
Estimated discard mortality (16%)	[28.7]	[40.3]	[29.3]	[55.8]	[37.4]		2.7	6.6
						2.7	6.6	6.4
Pot								
<u>Coastwide</u>								
Gross discard estimate						0.8	0.2	0.3
<i>Assuming 07-08 discard rate for 2002 - 2006</i>								
Estimated discard mortality (18%)	[0.2]	[0.4]	[0.4]	[0.8]	[0.9]			
						0.2	0.0	0.0

* The LE sablefish non-primary pot sector has not been observed by the WCGOP and therefore estimates are based on discard rates from observed OA fixed gear pot vessels. Because the OA fixed gear pot sector was only observed on a coastwide basis in 2007 and 2008, estimates for LE sablefish non-primary pot are only available in these years as well.

Table 12. Estimated total discard mortality (mt) of Pacific halibut from each sector of the non-nearshore fixed gear groundfish fishery from 2002 through 2009.

Estimated discard mortality (mt)				
	LE Sablefish Primary	LE Sablefish Non-Primary	OA Fixed Gear	All Sectors
2002	23.1	0.0	0.0	23.1
2003	32.5	0.0	0.0	32.5
2004	39.5	0.0	0.0	39.5
2005	36.6	0.0	0.0	36.6
2006	106.9	0.0	0.0	106.9
2007	21.0	0.2	2.9	24.1
2008	39.3	0.4	6.6	46.4
2009	49.7	0.0	6.4	56.1

Table 13. Pacific halibut length frequencies collected by WCGOP observers in the LE sablefish primary fixed gear sector from 2002-2009. Two tables are presented: (a) length frequency based on actual length measurements, and (b) length frequency based on visually estimated lengths. Visual estimates are approximated by essentially rounding to the nearest 10 cm.

(a) Actual length measurements

Length interval (cm)	Length freq.	Percent length freq.
25-30	0	0.00
30-35	0	0.00
35-40	0	0.00
40-45	0	0.00
45-50	0	0.00
50-55	2	0.01
55-60	3	0.02
60-65	8	0.06
65-70	16	0.12
70-75	34	0.25
75-80	29	0.21
80-85	14	0.10
85-90	9	0.07
90-95	9	0.07
95-100	6	0.04
100-105	3	0.02
105-110	0	0.00
110-115	2	0.01
115-120	0	0.00
120-125	2	0.01
125-130	0	0.00
130-135	0	0.00
135-140	1	0.01
140-145	0	0.00
145-150	0	0.00
150-155	0	0.00
155-160	0	0.00
160-165	0	0.00
165-170	0	0.00
170-175	0	0.00
175-180	0	0.00
180-185	0	0.00

(b) Visual length estimates

Approximate length	Number	Proportion
20 cm	0	0.00
30 cm	5	0.00
40 cm	29	0.00
50 cm	191	0.02
60 cm	1849	0.15
70 cm	2799	0.22
80 cm	3090	0.24
90 cm	2635	0.21
100 cm	1339	0.11
110 cm	528	0.04
120 cm	174	0.01
130 cm	43	0.00
140 cm	10	0.00
150 cm	0	0.00
160 cm	0	0.00
170 cm	0	0.00
180 cm	0	0.00

Table 14. Pacific halibut length data collected in the LE sablefish primary sector by the WCGOP approximating legal (≥ 80 cm) versus sublegal (< 80 cm) definitions by the IPHC. Both actual length measurements and visual length estimates are presented.

	Pacific halibut lengths	
	Number	Percentage
Actual length		
< 80 cm	88	63.8%
≥ 80 cm	50	36.2%
Visual estimate		
0 - 74 cm	4873	38.4%
75 - 84 cm	3090	24.3%
85 - 150 cm	4729	37.3%

Table 15. Coverage information, bycatch ratios, and bycatch estimates for Pacific halibut in the nearshore fixed gear groundfish sectors. The WCGOP began observing the California nearshore sector in 2003 and the Oregon nearshore sector in 2004. Bycatch estimates in this table are not intended to represent mortality values, as rates of discard mortality for this sector are not available.

	Observed							Total fleet catch of nearshore species (mt)	Estimated		
	Fleet observer coverage rate *	Number of observed sets	% of sets with Pacific halibut	Pacific halibut bycatch (kg)	Nearshore species retained (kg)	Pacific halibut bycatch rate	SE		Pacific halibut bycatch (mt)	Lower bound (mt)	Upper bound (mt)
Nearshore fixed gear groundfish fishery sector											
Oregon											
2002	<i>not observed</i>		-	-	-	-	-	279	-	-	-
2003	<i>not observed</i>		-	-	-	-	-	208	-	-	-
2004	4.9%	207	1.9%	48.9	10,210	0.0048	0.0027	210	1.005	0.002	2.123
2005	6.3%	167	0.6%	32.5	11,419	0.0028	0.0028	180	0.513	0.002	1.520
2006	11.6%	379	1.3%	62.8	19,396	0.0032	0.0016	168	0.543	0.005	1.081
2007	8.9%	242	0.4%	7.8	16,103	0.0005	0.0005	180	0.087	0.002	0.257
2008	7.6%	183	0.5%	27.2	14,285	0.0019	0.0019	189	0.360	0.002	1.066
2009	6.2%	219	2.3%	80.1	13,852	0.0058	0.0028	224	1.298	0.060	2.536
California											
2002	<i>not observed</i>		-	-	-	-	-	380	-	-	-
2003	3.2%	205	0.0%	0.0	8,085	0.0000	0.0000	255	0.000	0.000	0.000
2004	8.0%	422	0.0%	0.0	23,126	0.0000	0.0000	288	0.000	0.000	0.000
2005	4.7%	217	0.9%	79.5	13,108	0.0061	0.0054	280	1.695	0.003	4.665
2006	3.2%	158	0.0%	0.0	8,367	0.0000	0.0000	258	0.000	0.000	0.000
2007	4.5%	224	0.0%	0.0	12,138	0.0000	0.0000	271	0.000	0.000	0.000
2008	2.2%	87	0.0%	0.0	6,543	0.0000	0.0000	293	0.000	0.000	0.000
2009	2.6%	122	0.0%	0.0	6,723	0.0000	0.0000	260	0.000	0.000	0.000

* Coverage rate in the nearshore sector is defined as the proportion of nearshore target species landings that were observed. Nearshore target species are listed in Appendix C.

Table 16. Coverage information, bycatch ratios, and bycatch estimates for Pacific halibut in the pink shrimp trawl fishery. The WCGOP began observing the pink shrimp fishery in 2004, but was not able to observe the fishery 2006. Bycatch estimates in this table are not intended to represent mortality values, as rates of discard mortality for this fishery are not available.

		Observed					Estimated				
Fleet observer coverage rate *	Number of observed tows	% of tows with Pacific halibut	Pacific halibut bycatch (kg)	Pink shrimp retained (kg)	Pacific halibut bycatch rate	SE	Total fleet catch of pink shrimp (mt)	Pacific halibut bycatch (mt)	Lower bound (mt)	Upper bound (mt)	
Pink shrimp trawl fishery											
	2002	<i>not observed</i>	-	-	-	-	25,375	-	-	-	
	2003	<i>not observed</i>	-	-	-	-	13,887	-	-	-	
	2004	6.5%	1026	0.0%	0.0	583,266	0.000000	0.000000	0.000	0.000	
	2005	3.9%	509	0.2%	2.3	424,683	0.000005	0.000005	0.058	0.109	
	2006	<i>not observed</i>	-	-	-	-	8,400	-	-	-	
	2007	6.2%	951	0.2%	15.3	672,663	0.000023	0.000019	0.248	0.109	
	2008	5.2%	840	0.0%	0.0	805,763	0.000000	0.000000	0.000	0.000	
	2009	6.0%	695	0.0%	0.0	866,905	0.000000	0.000000	0.000	0.000	

* Coverage rate in the pink shrimp trawl fishery is defined as the proportion of pink shrimp landings that were observed.

Table 17. Coverage information, bycatch ratios, and bycatch estimates for Pacific halibut in the California halibut trawl fishery. This fishery is comprised of two components: a limited entry sector that operates primarily off of San Francisco, and an open access fishery that operates further south. Bycatch estimates in this table are not intended to represent mortality values, as rates of discard mortality for this fishery are not available.

		Observed					Estimated				
Fleet observer coverage rate *	Number of observed tows	% of tows with Pacific halibut	Pacific halibut bycatch (kg)	California halibut retained (kg)	Pacific halibut bycatch rate	SE	Total fleet catch of California halibut (mt)	Pacific halibut bycatch (mt)	Lower bound (mt)	Upper bound (mt)	
California halibut trawl fishery											
Limited Entry Sector											
	2002	3.2%	52	0.0%	0.0	3,590	0.0000	0.0000	0.000	0.000	
	2003	17.0%	206	0.0%	0.0	19,104	0.0000	0.0000	0.000	0.000	
	2004	16.7%	141	0.7%	3.5	23,447	0.0001	0.0001	0.021	0.001	
	2005	14.1%	221	0.5%	4.7	27,342	0.0002	0.0002	0.033	0.002	
	2006	11.7%	224	0.9%	2.9	14,286	0.0002	0.0002	0.025	0.001	
	2007	12.8%	80	1.3%	8.1	5,419	0.0015	0.0015	0.063	0.000	
	2008	24.6%	118	8.5%	82.6	9,637	0.0086	0.0030	0.336	0.108	
	2009	6.0%	29	0.0%	0.0	2,898	0.0000	0.0000	0.000	0.000	
Open Access Sector											
	2002	<i>not observed</i>	-	-	-	-	90	-	-	-	
	2003	4.3%	110	0.0%	0.0	1,977	0.0000	0.0000	0.000	0.000	
	2004	6.4%	244	1.6%	49.4	5,100	0.0097	0.0058	0.776	0.001	
	2005	9.7%	360	0.0%	0.0	7,489	0.0000	0.0000	0.000	0.000	
	2006	<i>not observed</i>	-	-	-	-	61	-	-	-	
	2007	6.9%	226	0.0%	0.0	2,694	0.0000	0.0000	0.000	0.000	
	2008	5.2%	197	0.0%	0.0	2,631	0.0000	0.0000	0.000	0.000	
	2009	0.7%	30	0.0%	0.0	634	0.0000	0.0000	0.000	0.000	

* Coverage rate in the California halibut trawl fishery is defined as the proportion of California halibut landings that were observed.

Table 18. Bycatch estimates for all fishery sectors observed by the West Coast Groundfish Observer Program (WCGOP) from 2002 through 2009. Total mortality estimates are also provided in cases when discard mortality rates were available.

	LE bottom trawl	Non-nearshore fixed gear			Nearshore fixed gear	Pink shrimp	CA halibut	Total
		LE primary	LE non-primary	OA				
Gross discard estimates (mt)								
2002	524	144	0.0	-	-	-	0.0	669
2003	187	203	0.1	-	0.0	-	0.0	390
2004	212	247	0.0	-	1.0	0.0	0.8	461
2005	460	229	0.0	-	2.2	0.1	0.0	692
2006	391	668	0.0	-	0.5	-	0.0	1059
2007	294	131	1.5	17.9	0.1	0.2	0.1	445
2008	305	246	2.7	41.3	0.4	0.0	0.3	596
2009	385	310	0.2	40.0	1.3	0.0	0.0	737
Total discard mortality (mt)								
2002	345	23	0.0	0.0	<i>no discard mortality rate available</i>			
2003	124	32	0.0	0.0	""			157
2004	133	40	0.0	0.0	""			173
2005	287	37	0.0	0.0	""			323
2006	242	107	0.0	0.0	""			350
2007	209	21	0.2	2.9	""			233
2008	208	39	0.4	6.6	""			254
2009	251	50	0.0	6.4	""			307

" - " Indicates years of incomplete or no observer coverage for which estimates are not available

APPENDIX A

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

SHARKS

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

RATFISH

Ratfish, *Hydrolagus colliei*

MORIDS

Finescale codling, *Antimora microlepis*

GRENADIERS

Pacific rattail, *Coryphaenoides acrolepis*

ROUND FISH

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

FLATFISH

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

ROCKFISH

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

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

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

APPENDIX B

Species identification codes used in the Pacific Fisheries Information Network (PacFIN) database and assigned to WCGOP observer data, with aggregated species groups used in this report for the non-nearshore sectors of the groundfish fishery.

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

PacFIN Species ID	PacFIN Common Name	Species Group - North of 40° 10' N latitude	Species Group - South of 40° 10' N latitude	FMP
CBZ1	NOM. CABEZON	Other groundfish	Cabezon	yes
CBZN	CABEZON	Other groundfish	Cabezon	yes
CEEL	SPOTTED CUSK-EEL	Other nongroundfish	Other nongroundfish	
CHL1	NOM. CALIFORNIA HALIBUT	California halibut	California halibut	
CHLB	CALIFORNIA HALIBUT	California halibut	California halibut	
CHN1	NOM. CHINA ROCKFISH	Other nearshore rockfish	Other nearshore rockfish	yes
CHNA	CHINA ROCKFISH	Other nearshore rockfish	Other nearshore rockfish	yes
CHNK	CHINOOK SALMON	Other nongroundfish	Other nongroundfish	
CHUM	CHUM SALMON	Other nongroundfish	Other nongroundfish	
CKLE	BASKET COCKLE	Other nongroundfish	Other nongroundfish	
CLC1	NOM. CALICO ROCKFISH	Other nearshore rockfish	Other nearshore rockfish	yes
CLCO	CALICO ROCKFISH	Other nearshore rockfish	Other nearshore rockfish	yes
CLP1	NOM. CHILIPEPPER	Chilipepper (Remaining rockfish)	Chilipepper	yes
CLPR	CHILIPEPPER	Chilipepper (Remaining rockfish)	Chilipepper	yes
CMCK	CHUB MACKEREL	Other nongroundfish	Other nongroundfish	
CMEL	CHAMELEON ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
CML1	NOM. CHAMELEON ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
CMSL	CALIFORNIA MUSSEL	Other nongroundfish	Other nongroundfish	
CNR1	NOM. CANARY ROCKFISH	Canary rockfish	Canary rockfish	yes
CNRY	CANARY ROCKFISH	Canary rockfish	Canary rockfish	yes
COHO	COHO SALMON	Other nongroundfish	Other nongroundfish	
COP1	NOM. COPPER ROCKFISH	Other nearshore rockfish	Other nearshore rockfish	yes
COPP	COPPER ROCKFISH	Other nearshore rockfish	Other nearshore rockfish	yes
CPLN	CAPELIN	Other nongroundfish	Other nongroundfish	
CSKT	CALIFORNIA SKATE	Unspecified skate	Unspecified skate	yes
CSOL	CURLFIN SOLE	Other flatfish	Other flatfish	yes
CTRB	C-O SOLE	Other non-FMP flatfish	Other non-FMP flatfish	
CUDA	PACIFIC BARRACUDA	Other nongroundfish	Other nongroundfish	
CWC1	NOM. COWCOD ROCKFISH	Other shelf rockfish	Cowcod	yes
CWCD	COWCOD ROCKFISH	Other shelf rockfish	Cowcod	yes
DBR1	NOM. DARKBLOTCHED ROCKFISH	Darkblotched rockfish	Darkblotched rockfish	yes
DBRK	DARKBLOTCHED ROCKFISH	Darkblotched rockfish	Darkblotched rockfish	yes
DCRB	DUNGENESS CRAB	Dungeness crab	Dungeness crab	
DFLT	UNSP. DEEP FLOUNDERS	Other flatfish	Other flatfish	yes
DOVR	DOVER SOLE	Dover sole	Dover sole	yes
DRDO	DORADO	Other nongroundfish	Other nongroundfish	
DSOL	DEEPSEA SOLE	Other non-FMP flatfish	Other non-FMP flatfish	
DSRK	SPINY DOGFISH	Spiny dogfish	Spiny dogfish	yes
DTRB	DIAMOND TURBOT	Other non-FMP flatfish	Other non-FMP flatfish	
DUSK	DUSKY ROCKFISH	Other groundfish	Other groundfish	yes
DVR1	NOM. DOVER SOLE	Dover sole	Dover sole	yes
DWRF	DWARF-RED ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
EELS	UNSPECIFIED EELS	Other nongroundfish	Other nongroundfish	
EGL1	NOM. ENGLISH SOLE	English sole	English sole	yes
EGLS	ENGLISH SOLE	English sole	English sole	yes

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

PacFIN Species ID	PacFIN Common Name	Species Group - North of 40° 10' N latitude	Species Group - South of 40° 10' N latitude	FMP
KSTR	KUMAMOTO OYSTER	Other nongroundfish	Other nongroundfish	
LCD1	NOM. LINGCOD	Lingcod	Lingcod	yes
LCLM	NATIVE LITTLENECK	Other nongroundfish	Other nongroundfish	
LCOD	LINGCOD	Lingcod	Lingcod	yes
LDAB	LONGFIN SANDDAB	Other non-FMP flatfish	Other non-FMP flatfish	
LDB1	NOM. LONGFIN SANDDAB	Other non-FMP flatfish	Other non-FMP flatfish	
LOBS	CALIF. SPINY LOBSTER	Other nongroundfish	Other nongroundfish	
LSKT	LONGNOSE SKATE	Longnose skate	Longnose skate	yes
LSP1	NOM. LONGSPINE THORNYHEAD	Longspine thornyhead	Longspine thornyhead	yes
LSPN	LONGSPINE THORNYHEAD	Longspine thornyhead	Longspine thornyhead	yes
LSRK	LEOPARD SHARK	Other groundfish	Other groundfish	yes
LSTR	OLYMPIA OYSTER	Other nongroundfish	Other nongroundfish	
LUVR	LOUVAR	Other nongroundfish	Other nongroundfish	
MACL	MUD CLAMS	Other nongroundfish	Other nongroundfish	
MAKO	SHORTFIN MAKO SHARK	Other nongroundfish	Other nongroundfish	
MCLM	MANILA CLAM	Other nongroundfish	Other nongroundfish	
MEEL	MONKEYFACE EEL	Other nongroundfish	Other nongroundfish	
MISC	MISC. FISH/ANIMALS	Other nongroundfish	Other nongroundfish	
MOLA	COMMON MOLA	Other nongroundfish	Other nongroundfish	
MRLN	STRIPED MARLIN	Other nongroundfish	Other nongroundfish	
MSC2	MISCELLANEOUS FISH	Other nongroundfish	Other nongroundfish	
MSHP	PLAINFIN MIDSHIPMAN	Other nongroundfish	Other nongroundfish	
MSQD	MARKET SQUID	Other nongroundfish	Other nongroundfish	
MSRM	MUD SHRIMP	Other nongroundfish	Other nongroundfish	
MXR1	NOM. MEXICAN ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
MXRF	MEXICAN ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
NANC	NORTHERN ANCHOVY	Other nongroundfish	Other nongroundfish	
NRCK	NORTHERN ROCKFISH	Other groundfish	Other groundfish	yes
NSHR	NORTHERN NEAR-SHORE RK	Other nearshore rockfish	Other nearshore rockfish	yes
NSLF	NORTHERN SHELF ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
NSLP	NORTHERN SLOPE ROCKFISH	Other slope rockfish	Other slope rockfish	yes
NUSF	NOR. UNSP. SHELF ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
NUSP	NOR. UNSP. SLOPE ROCKFISH	Other slope rockfish	Other slope rockfish	yes
NUSR	NOR. UNSP. NEAR-SHORE RK	Other nearshore rockfish	Other nearshore rockfish	yes
OABL	OTHER ABALONE	Other nongroundfish	Other nongroundfish	
OANC	OTHER ANCHOVY	Other nongroundfish	Other nongroundfish	
OBAS	OTHER BASS	Other nongroundfish	Other nongroundfish	
OCLM	OTHER CLAM	Other nongroundfish	Other nongroundfish	
OCRB	OTHER CRAB	Other nongroundfish	Other nongroundfish	
OCRK	OTHER CROAKER	Other nongroundfish	Other nongroundfish	
OCTP	UNSP. OCTOPUS	Other nongroundfish	Other nongroundfish	
ODSR	OTHER DEMERSAL RKFSH	Other groundfish	Other groundfish	yes
OECH	OTHER ECHINODERM	Other nongroundfish	Other nongroundfish	
OFLT	OTHER FLATFISH	Other flatfish	Other flatfish	yes
OGRN	OTHER GROUND FISH	Other groundfish	Other groundfish	yes
OLV1	NOM. OLIVE ROCKFISH	Other nearshore rockfish	Other nearshore rockfish	yes

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

PacFIN Species ID	PacFIN Common Name	Species Group - North of 40° 10' N latitude	Species Group - South of 40° 10' N latitude	FMP
QCLM	NORTHERN QUAHOG CLAM	Other nongroundfish	Other nongroundfish	
QFSH	QUEENFISH	Other nongroundfish	Other nongroundfish	
QLB1	NOM. QUILLBACK ROCKFISH	Other nearshore rockfish	Other nearshore rockfish	yes
QLBK	QUILLBACK ROCKFISH	Other nearshore rockfish	Other nearshore rockfish	yes
RABL	RED ABALONE	Other nongroundfish	Other nongroundfish	
RATF	SPOTTED RATFISH	Other groundfish	Other groundfish	yes
RCK1	BOCACCIO+CHILIPEPPER RK	Other shelf rockfish	Other shelf rockfish	yes
RCK2	UNSP. BOLINA RCKFSH	Other nearshore rockfish	Other nearshore rockfish	yes
RCK3	UNSP. DPWTR REDS RCKFSH	Other slope rockfish	Other slope rockfish	yes
RCK4	UNSP. REDS RCKFSH	Other groundfish	Other groundfish	yes
RCK5	UNSP. SMALL REDS RCKFSH	Other groundfish	Other groundfish	yes
RCK6	UNSP. ROSEFISH RCKFSH	Other groundfish	Other groundfish	yes
RCK7	UNSP. GOPHER RCKFSH	Other nearshore rockfish	Gopher rockfish (Remaining rockfish)	yes
RCK8	CANARY+VERMILION RCKFSH	Canary rockfish	Canary rockfish	yes
RCK9	BLACK+BLUE ROCKFISH	Black rockfish	Black rockfish	yes
RCKG	ROCK GREENLING	Other nongroundfish	Other nongroundfish	
RCLM	RAZOR CLAM	Other nongroundfish	Other nongroundfish	
RCRB	ROCK CRAB	Other nongroundfish	Other nongroundfish	
RDB1	NOM. REDBANDED ROCKFISH	Other slope rockfish	Other slope rockfish	yes
RDBD	REDBANDED ROCKFISH	Other slope rockfish	Other slope rockfish	yes
REDS	REDSTRIPE ROCKFISH	Redstripe rockfish (Remaining rockfish)	Other shelf rockfish	yes
REX	REX SOLE	Other flatfish	Other flatfish	yes
REX1	NOM. REX SOLE	Other flatfish	Other flatfish	yes
REYE	ROUGHEYE ROCKFISH	Other slope rockfish	Other slope rockfish	yes
RFLT	REMAINING FLATFISH	Other flatfish	Other flatfish	yes
RGL1	NOM. ROCK GREENLING	Other nongroundfish	Other nongroundfish	
RGRN	REMAINING GROUND FISH	Other groundfish	Other groundfish	yes
RHRG	ROUND HERRING	Other nongroundfish	Other nongroundfish	
RKCR	RED KING CRAB	Other nongroundfish	Other nongroundfish	
ROS1	NOM. ROSY ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
ROSY	ROSY ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
RPRW	RIDGEBACK PRAWN	Other nongroundfish	Other nongroundfish	
RRCK	REMAINING ROCKFISH	Other groundfish	Other groundfish	yes
RRND	REMAINING ROUND FISH	Other groundfish	Other groundfish	yes
RSL1	NOM. ROCK SOLE	Other flatfish	Other flatfish	yes
RSOL	ROCK SOLE	Other flatfish	Other flatfish	yes
RST1	NOM. ROSETHORN ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
RSTN	ROSETHORN ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
RURC	RED SEA URCHIN	Other nongroundfish	Other nongroundfish	
RZCL	ROSY RAZOR CLAM	Other nongroundfish	Other nongroundfish	
SABL	SABLEFISH	Sablefish	Sablefish	yes
SAIL	SAILFISH	Other nongroundfish	Other nongroundfish	
SARY	PACIFIC SAURY	Other nongroundfish	Other nongroundfish	
SBL1	NOM. SHORTBELLY ROCKFISH	Shortbelly rockfish	Shortbelly rockfish	yes
SBLY	SHORTBELLY ROCKFISH	Shortbelly rockfish	Shortbelly rockfish	yes

PacFIN Species ID	PacFIN Common Name	Species Group - North of 40° 10' N latitude	Species Group - South of 40° 10' N latitude	FMP
SCLM	SOFT-SHELLED CLAM	Other nongroundfish	Other nongroundfish	
SCLP	UNSP. SCULPIN	Other nongroundfish	Other nongroundfish	
SCOR	CALIFORNIA SCORPIONFISH	Other groundfish	Other nearshore rockfish	yes
SCR1	NOM. CALIF. SCORPIONFISH	Other groundfish	Other nearshore rockfish	yes
SDB1	NOM. SPECKLED SANDDAB	Other non-FMP flatfish	Other non-FMP flatfish	
SFL1	NOM. STARRY FLOUNDER	Starry flounder	Starry flounder	yes
SFLT	UNSP. SHALLOW FLOUNDERS	Other flatfish	Other flatfish	yes
SHAD	UNSPECIFIED SHAD	Other nongroundfish	Other nongroundfish	
SHP1	NOM. CALIFORNIA SHEEPHEAD	Other nongroundfish	Other nongroundfish	
SHPD	CALIFORNIA SHEEPHEAD	Other nongroundfish	Other nongroundfish	
SHRP	SHARPCHIN ROCKFISH	Sharpchin rockfish (Remaining rockfish)	Sharpchin - south	yes
SKCR	SCARLET KING CRAB	Other nongroundfish	Other nongroundfish	
SLGR	SILVERGREY ROCKFISH	Silvergrey rockfish (Remaining rockfish)	Other shelf rockfish	yes
SLNS	SLENDER SOLE	Other non-FMP flatfish	Other non-FMP flatfish	
SMLT	UNSP. SMELT	Other nongroundfish	Other nongroundfish	
SNOS	SPLITNOSE ROCKFISH	Splitnose rockfish (Remaining rockfish)	Splitnose rockfish	yes
SNS1	NOM. SPLITNOSE ROCKFISH	Splitnose rockfish (Remaining rockfish)	Splitnose rockfish	yes
SOCK	SOCKEYE SALMON	Other nongroundfish	Other nongroundfish	
SPK1	NOM. SPECKLED ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
SPKL	SPECKLED ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
SPRW	SPOTTED PRAWN	Other nongroundfish	Other nongroundfish	
SQID	UNSP. SQUID	Other nongroundfish	Other nongroundfish	
SQR1	NOM. SQUARESPOT	Other shelf rockfish	Other shelf rockfish	yes
SQRS	SQUARESPOT ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
SRFP	SURFPERCH SPP.	Other nongroundfish	Other nongroundfish	
SRKR	SHORTRAKER ROCKFISH	Other slope rockfish	Other slope rockfish	yes
SSCL	SHARPNOSE SCULPIN	Other nongroundfish	Other nongroundfish	
SSDB	SPECKLED SANDDAB	Other non-FMP flatfish	Other non-FMP flatfish	
SSHR	SOUTHERN NEAR-SHORE RK	Other nearshore rockfish	Other nearshore rockfish	yes
SSLF	SOUTHERN SHELF ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
SSLP	SOUTHERN SLOPE ROCKFISH	Other slope rockfish	Other slope rockfish	yes
SSO1	NOM. SAND SOLE	Other flatfish	Other flatfish	yes
SSOL	SAND SOLE	Other flatfish	Other flatfish	yes
SSP1	NOM. SHORTSPINE THORNYHEAD	Shortspine thornyhead	Shortspine thornyhead	yes
SSPN	SHORTSPINE THORNYHEAD	Shortspine thornyhead	Shortspine thornyhead	yes
SSRD	Deep So. Nearshore RF	Other nearshore rockfish	Other nearshore rockfish	yes
SSRK	SOUPFIN SHARK	Other groundfish	Other groundfish	yes
SSRS	Shallow So. Nearshore RF	Other nearshore rockfish	Other nearshore rockfish	yes
STAR	STARRY ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
STL1	NOM. STRIPETAIL ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
STLH	STEELHEAD	Other nongroundfish	Other nongroundfish	
STNA	SKIPJACK TUNA	Other nongroundfish	Other nongroundfish	
STR1	NOM. STARRY ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
STRK	STRIPETAIL ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes

PacFIN Species ID	PacFIN Common Name	Species Group - North of 40° 10' N latitude	Species Group - South of 40° 10' N latitude	FMP
STRY	STARRY FLOUNDER	Starry flounder	Starry flounder	yes
SUSF	SOU. UNSP. SHELF ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
SUSP	SOU. UNSP. SLOPE ROCKFISH	Other slope rockfish	Other slope rockfish	yes
SUSR	SOU. UNSP. NEAR-SHORE RK	Other nearshore rockfish	Other nearshore rockfish	yes
SWRD	SWORDFISH	Other nongroundfish	Other nongroundfish	
SWS1	NOM. SWORDSPINE ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
SWSP	SWORDSPINE ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
TCOD	PACIFIC TOMCOD	Other nongroundfish	Other nongroundfish	
TGR1	NOM. TIGER ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
THD1	NOM. THORNYHEADS	Mixed thornyheads	Mixed thornyheads	yes
THDS	THORNYHEADS (MIXED)	Mixed thornyheads	Mixed thornyheads	yes
TIGR	TIGER ROCKFISH	Other shelf rockfish	Other shelf rockfish	yes
TRE1	NOM. TREEFISH	Other nearshore rockfish	Other nearshore rockfish	yes
TREE	TREEFISH	Other nearshore rockfish	Other nearshore rockfish	yes
TSRK	COMMON THRESHER SHARK	Other nongroundfish	Other nongroundfish	
UABL	UNSPECIFIED ABALONE	Other nongroundfish	Other nongroundfish	
UCLM	UNSPECIFIED CLAM	Other nongroundfish	Other nongroundfish	
UCRB	UNSPECIFIED CRAB	Other nongroundfish	Other nongroundfish	
UDAB	UNSP. SANDDABS	Other flatfish	Other flatfish	yes
UDF1	UNSP. DEEP-91 FLOUNDERS	Other flatfish	Other flatfish	yes
UDF2	UNSP. DEEP-95 FLOUNDERS	Other flatfish	Other flatfish	yes
UDM1	UNSP. DEMERSAL-91	Other groundfish	Other groundfish	yes
UDNR	UNSP. DEEP NEAR-SHORE RF	Other nearshore rockfish	Other nearshore rockfish	yes
UDSR	UNSP. DEMERSAL RKFSH	Other groundfish	Other groundfish	yes
UDW1	SHORTRAKER+ROUGHEYE	Other slope rockfish	Other slope rockfish	yes
UECH	UNSPECIFIED ECHINODERM	Other nongroundfish	Other nongroundfish	
UFL1	FLOUNDERS (NO FSOL)	Other flatfish	Other flatfish	yes
UFLT	UNSP. FLATFISH	Other flatfish	Other flatfish	yes
UGRN	UNSP. GROUND FISH	Other groundfish	Other groundfish	yes
UHAG	UNSPECIFIED HAGFISH	Other nongroundfish	Other nongroundfish	
UHLB	UNSPECIFIED HALIBUT	Other nongroundfish	Other nongroundfish	
UJEL	UNSP. JELLYFISH	Other nongroundfish	Other nongroundfish	
UKCR	UNSP. KING CRAB	Other nongroundfish	Other nongroundfish	
UMCK	UNSP. MACKEREL	Other nongroundfish	Other nongroundfish	
UMSK	UNSPECIFIED MOLLUSKS	Other nongroundfish	Other nongroundfish	
UPLG	UNSP. PELAGIC RKFSH	Other groundfish	Other groundfish	yes
UPOP	UNSP. POP GROUP	Pacific ocean perch	Other slope rockfish	yes
URCK	UNSP. ROCKFISH	Other slope rockfish (>150 fm)	Other slope rockfish (>150 fm)	yes
URCK	UNSP. ROCKFISH	Other shelf rockfish (<150 fm)	Other shelf rockfish (<150 fm)	yes
URK1	SRKR+REYE+NRCK+SHRP	Other slope rockfish	Other slope rockfish	yes
URND	UNSP. ROUND FISH	Other groundfish	Other groundfish	yes
USCL	UNSPECIFIED SCALLOP	Other nongroundfish	Other nongroundfish	
USCU	UNSP. SEA CUCUMBERS	Other nongroundfish	Other nongroundfish	
USF1	UNSP. SHALLOW-91 FLOUNDERS	Other flatfish	Other flatfish	yes
USHR	UNSP. NEAR-SHORE ROCKFISH	Other nearshore rockfish	Other nearshore rockfish	yes
USKT	UNSP. SKATE	Unspecified skate	Unspecified skate	yes

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

APPENDIX C

Species identification codes used in the Pacific Coast Fisheries Information Network (PacFIN) database and assigned to WCGOP observer data, with aggregated species groups used in this report for the nearshore fixed gear sector of the groundfish fishery.

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

PacFIN Species ID	PacFIN Common Name	Species Group - North of 40° 10' N latitude	Species Group - South of 40° 10' N latitude	NS Species
BYL1	NOM. BLACK-AND-YELLOW RK	Other minor nearshore rockfish	Shallow nearshore rockfish	yes
CBZ1	NOM. CABEZON	Cabezon	Cabezon	yes
CBZN	CABEZON	Cabezon	Cabezon	yes
CEEL	SPOTTED CUSK-EEL	Other nongroundfish	Other nongroundfish	
CHL1	NOM. CALIFORNIA HALIBUT	California halibut	California halibut	
CHLB	CALIFORNIA HALIBUT	California halibut	California halibut	
CHN1	NOM. CHINA ROCKFISH	Other minor nearshore rockfish	Shallow nearshore rockfish	yes
CHNA	CHINA ROCKFISH	Other minor nearshore rockfish	Shallow nearshore rockfish	yes
CHNK	CHINOOK SALMON	Other nongroundfish	Other nongroundfish	
CHUM	CHUM SALMON	Other nongroundfish	Other nongroundfish	
CKLE	BASKET COCKLE	Other nongroundfish	Other nongroundfish	
CLC1	NOM. CALICO ROCKFISH	Other minor nearshore rockfish	Deeper nearshore rockfish	yes
CLCO	CALICO ROCKFISH	Other minor nearshore rockfish	Deeper nearshore rockfish	yes
CLP1	NOM. CHILIPEPPER	Chilipepper (Remaining rockfish)	Chilipepper	
CLPR	CHILIPEPPER	Chilipepper (Remaining rockfish)	Chilipepper	
CMCK	CHUB MACKEREL	Other nongroundfish	Other nongroundfish	
CMEL	CHAMELEON ROCKFISH	Minor shelf rockfish	Minor shelf rockfish	
CML1	NOM. CHAMELEON ROCKFISH	Minor shelf rockfish	Minor shelf rockfish	
CMSL	CALIFORNIA MUSSEL	Other nongroundfish	Other nongroundfish	
CNR1	NOM. CANARY ROCKFISH	Canary rockfish	Canary rockfish	
CNRY	CANARY ROCKFISH	Canary rockfish	Canary rockfish	
COHO	COHO SALMON	Other nongroundfish	Other nongroundfish	
COP1	NOM. COPPER ROCKFISH	Other minor nearshore rockfish	Deeper nearshore rockfish	yes
COPP	COPPER ROCKFISH	Other minor nearshore rockfish	Deeper nearshore rockfish	yes
CPLN	CAPELIN	Other nongroundfish	Other nongroundfish	
CSKT	CALIFORNIA SKATE	Unspecified skate	Unspecified skate	
CSOL	CURLFIN SOLE	Other flatfish	Other flatfish	
CTRB	C-O SOLE	Other non-FMP flatfish	Other non-FMP flatfish	
CUDA	PACIFIC BARRACUDA	Other nongroundfish	Other nongroundfish	
CWC1	NOM. COWCOD ROCKFISH	Minor shelf rockfish	Cowcod	
CWCD	COWCOD ROCKFISH	Minor shelf rockfish	Cowcod	
DBR1	NOM. DARKBLOTCHED ROCKFISH	Darkblotched rockfish	Darkblotched rockfish	
DBRK	DARKBLOTCHED ROCKFISH	Darkblotched rockfish	Darkblotched rockfish	
DCRB	DUNGENESS CRAB	Dungeness crab	Dungeness crab	
DFLT	UNSP. DEEP FLOUNDERS	Other flatfish	Other flatfish	
DOVR	DOVER SOLE	Dover sole	Dover sole	
DRDO	DORADO	Other nongroundfish	Other nongroundfish	
DSOL	DEEPSEA SOLE	Other non-FMP flatfish	Other non-FMP flatfish	
DSRK	SPINY DOGFISH	Spiny dogfish	Spiny dogfish	
DTRB	DIAMOND TURBOT	Other non-FMP flatfish	Other non-FMP flatfish	
DUSK	DUSKY ROCKFISH	Other groundfish	Other groundfish	
DVR1	NOM. DOVER SOLE	Dover sole	Dover sole	
DWRF	DWARF-RED ROCKFISH	Minor shelf rockfish	Minor shelf rockfish	
EELS	UNSPECIFIED EELS	Other nongroundfish	Other nongroundfish	
EGL1	NOM. ENGLISH SOLE	English sole	English sole	
EGLS	ENGLISH SOLE	English sole	English sole	

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

PacFIN Species ID	PacFIN Common Name	Species Group - North of 40° 10' N latitude	Species Group - South of 40° 10' N latitude	NS Species
KSTR	KUMAMOTO OYSTER	Other nongroundfish	Other nongroundfish	
LCD1	NOM. LINGCOD	Lingcod	Lingcod	yes
LCLM	NATIVE LITTLENECK	Other nongroundfish	Other nongroundfish	
LCOD	LINGCOD	Lingcod	Lingcod	yes
LDAB	LONGFIN SANDDAB	Other non-FMP flatfish	Other non-FMP flatfish	
LDB1	NOM. LONGFIN SANDDAB	Other non-FMP flatfish	Other non-FMP flatfish	
LOBS	CALIF. SPINY LOBSTER	Other nongroundfish	Other nongroundfish	
LSKT	LONGNOSE SKATE	Longnose skate	Longnose skate	
LSP1	NOM. LONGSPINE THORNYHEAD	Longspine thornyhead	Longspine thornyhead	
LSPN	LONGSPINE THORNYHEAD	Longspine thornyhead	Longspine thornyhead	
LSRK	LEOPARD SHARK	Other groundfish	Other groundfish	
LSTR	OLYMPIA OYSTER	Other nongroundfish	Other nongroundfish	
LUVR	LOUVAR	Other nongroundfish	Other nongroundfish	
MACL	MUD CLAMS	Other nongroundfish	Other nongroundfish	
MAKO	SHORTFIN MAKO SHARK	Other nongroundfish	Other nongroundfish	
MCLM	MANILA CLAM	Other nongroundfish	Other nongroundfish	
MEEL	MONKEYFACE EEL	Other nongroundfish	Other nongroundfish	
MISC	MISC. FISH/ANIMALS	Other nongroundfish	Other nongroundfish	
MOLA	COMMON MOLA	Other nongroundfish	Other nongroundfish	
MRLN	STRIPED MARLIN	Other nongroundfish	Other nongroundfish	
MSC2	MISCELLANEOUS FISH	Other nongroundfish	Other nongroundfish	
MSHP	PLAINFIN MIDSHIPMAN	Other nongroundfish	Other nongroundfish	
MSQD	MARKET SQUID	Other nongroundfish	Other nongroundfish	
MSRM	MUD SHRIMP	Other nongroundfish	Other nongroundfish	
MXR1	NOM. MEXICAN ROCKFISH	Minor shelf rockfish	Minor shelf rockfish	
MXRF	MEXICAN ROCKFISH	Minor shelf rockfish	Minor shelf rockfish	
NANC	NORTHERN ANCHOVY	Other nongroundfish	Other nongroundfish	
NRCK	NORTHERN ROCKFISH	Other groundfish	Other groundfish	
NSHR	NORTHERN NEAR-SHORE RK	Other minor nearshore rockfish	Northern nearshore rockfish	yes
NSLF	NORTHERN SHELF ROCKFISH	Minor shelf rockfish	Minor shelf rockfish	
NSLP	NORTHERN SLOPE ROCKFISH	Minor slope rockfish	Minor slope rockfish	
NUSF	NOR. UNSP. SHELF ROCKFISH	Minor shelf rockfish	Minor shelf rockfish	
NUSP	NOR. UNSP. SLOPE ROCKFISH	Minor slope rockfish	Minor slope rockfish	
NUSR	NOR. UNSP. NEAR-SHORE RK	Other minor nearshore rockfish	Northern nearshore rockfish	yes
OABL	OTHER ABALONE	Other nongroundfish	Other nongroundfish	
OANC	OTHER ANCHOVY	Other nongroundfish	Other nongroundfish	
OBAS	OTHER BASS	Other nongroundfish	Other nongroundfish	
OCLM	OTHER CLAM	Other nongroundfish	Other nongroundfish	
OCRB	OTHER CRAB	Other nongroundfish	Other nongroundfish	
OCRK	OTHER CROAKER	Other nongroundfish	Other nongroundfish	
OCTP	UNSP. OCTOPUS	Other nongroundfish	Other nongroundfish	
ODSR	OTHER DEMERSAL RKFSH	Other groundfish	Other groundfish	
OECH	OTHER ECHINODERM	Other nongroundfish	Other nongroundfish	
OFLT	OTHER FLATFISH	Other flatfish	Other flatfish	
OGRN	OTHER GROUND FISH	Other groundfish	Other groundfish	
OLV1	NOM. OLIVE ROCKFISH	Other minor nearshore rockfish	Deeper nearshore rockfish	yes

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

PacFIN Species ID	PacFIN Common Name	Species Group - North of 40° 10' N latitude	Species Group - South of 40° 10' N latitude	NS Species
QCLM	NORTHERN QUAHOG CLAM	Other nongroundfish	Other nongroundfish	
QFSH	QUEENFISH	Other nongroundfish	Other nongroundfish	
QLB1	NOM. QUILLBACK ROCKFISH	Other minor nearshore rockfish	Deeper nearshore rockfish	yes
QLBK	QUILLBACK ROCKFISH	Other minor nearshore rockfish	Deeper nearshore rockfish	yes
RABL	RED ABALONE	Other nongroundfish	Other nongroundfish	
RATF	SPOTTED RATFISH	Other groundfish	Other groundfish	
RCK1	BOCACCIO+CHILIPEPPER RCKFSH	Minor shelf rockfish	Minor shelf rockfish	
RCK2	UNSP. BOLINA RCKFSH	Other minor nearshore rockfish	Deeper nearshore rockfish	yes
RCK3	UNSP. DPWTR REDS RCKFSH	Minor slope rockfish	Minor slope rockfish	
RCK4	UNSP. REDS RCKFSH	Other groundfish	Other groundfish	
RCK5	UNSP. SMALL REDS RCKFSH	Other groundfish	Other groundfish	
RCK6	UNSP. ROSEFISH RCKFSH	Other groundfish	Other groundfish	
RCK7	UNSP. GOPHER RCKFSH	Other minor nearshore rockfish	Gopher rockfish (Remaining rockfish)	yes
RCK8	CANARY+VERMILION RCKFSH	Canary rockfish	Canary rockfish	
RCK9	BLACK+BLUE ROCKFISH	Black rockfish	Black rockfish	yes
RCKG	ROCK GREENLING	Other nongroundfish	Other nongroundfish	
RCLM	RAZOR CLAM	Other nongroundfish	Other nongroundfish	
RCRB	ROCK CRAB	Other nongroundfish	Other nongroundfish	
RDB1	NOM. REDBANDED ROCKFISH	Minor slope rockfish	Minor slope rockfish	
RDBD	REDBANDED ROCKFISH	Minor slope rockfish	Minor slope rockfish	
REDS	REDSTRIPE ROCKFISH	Redstripe rockfish (Remaining rockfish)	Minor shelf rockfish	
REX	REX SOLE	Other flatfish	Other flatfish	
REX1	NOM. REX SOLE	Other flatfish	Other flatfish	
REYE	ROUGHEYE ROCKFISH	Minor slope rockfish	Minor slope rockfish	
RFLT	REMAINING FLATFISH	Other flatfish	Other flatfish	
RGL1	NOM. ROCK GREENLING	Other nongroundfish	Other nongroundfish	
RGRN	REMAINING GROUND FISH	Other groundfish	Other groundfish	
RHRG	ROUND HERRING	Other nongroundfish	Other nongroundfish	
RKCR	RED KING CRAB	Other nongroundfish	Other nongroundfish	
ROS1	NOM. ROSY ROCKFISH	Minor shelf rockfish	Minor shelf rockfish	
ROSY	ROSY ROCKFISH	Minor shelf rockfish	Minor shelf rockfish	
RPRW	RIDGEBACK PRAWN	Other nongroundfish	Other nongroundfish	
RRCK	REMAINING ROCKFISH	Other groundfish	Other groundfish	
RRND	REMAINING ROUND FISH	Other groundfish	Other groundfish	
RSL1	NOM. ROCK SOLE	Other flatfish	Other flatfish	
RSOL	ROCK SOLE	Other flatfish	Other flatfish	
RST1	NOM. ROSETHORN ROCKFISH	Minor shelf rockfish	Minor shelf rockfish	
RSTN	ROSETHORN ROCKFISH	Minor shelf rockfish	Minor shelf rockfish	
RURC	RED SEA URCHIN	Other nongroundfish	Other nongroundfish	
RZCL	ROSY RAZOR CLAM	Other nongroundfish	Other nongroundfish	
SABL	SABLEFISH	Sablefish	Sablefish	
SAIL	SAILFISH	Other nongroundfish	Other nongroundfish	
SARY	PACIFIC SAURY	Other nongroundfish	Other nongroundfish	
SBL1	NOM. SHORTBELLY ROCKFISH	Shortbelly rockfish	Shortbelly rockfish	
SBLY	SHORTBELLY ROCKFISH	Shortbelly rockfish	Shortbelly rockfish	

PacFIN Species ID	PacFIN Common Name	Species Group - North of 40° 10' N latitude	Species Group - South of 40° 10' N latitude	NS Species
SCLM	SOFT-SHELLED CLAM	Other nongroundfish	Other nongroundfish	
SCLP	UNSP. SCULPIN	Other nongroundfish	Other nongroundfish	
SCOR	CALIFORNIA SCORPIONFISH	Other minor nearshore rockfish	Shallow nearshore rockfish	yes
SCR1	NOM. CALIF. SCORPIONFISH	Other minor nearshore rockfish	Shallow nearshore rockfish	yes
SDB1	NOM. SPECKLED SANDDAB	Other non-FMP flatfish	Other non-FMP flatfish	
SFL1	NOM. STARRY FLOUNDER	Starry flounder	Starry flounder	
SFLT	UNSP. SHALLOW FLOUNDERS	Other flatfish	Other flatfish	
SHAD	UNSPECIFIED SHAD	Other nongroundfish	Other nongroundfish	
SHP1	NOM. CALIFORNIA SHEEPHEAD	California sheephead	California sheephead	yes
SHPD	CALIFORNIA SHEEPHEAD	California sheephead	California sheephead	yes
SHRP	SHARPCHIN ROCKFISH	Sharpchin rockfish (Remaining rockfish)	Sharpchin rockfish (Remaining rockfish)	
SKCR	SCARLET KING CRAB	Other nongroundfish	Other nongroundfish	
SLGR	SILVERGREY ROCKFISH	Silvergray rockfish (Remaining rockfish)	Minor shelf rockfish	
SLNS	SLENDER SOLE	Other non-FMP flatfish	Other non-FMP flatfish	
SMLT	UNSP. SMELT	Other nongroundfish	Other nongroundfish	
SNOS	SPLITNOSE ROCKFISH	Splitnose rockfish (Remaining rockfish)	Splitnose rockfish	
SNS1	NOM. SPLITNOSE ROCKFISH	Splitnose rockfish (Remaining rockfish)	Splitnose rockfish	
SOCK	SOCKEYE SALMON	Other nongroundfish	Other nongroundfish	
SPK1	NOM. SPECKLED ROCKFISH	Minor shelf rockfish	Minor shelf rockfish	
SPKL	SPECKLED ROCKFISH	Minor shelf rockfish	Minor shelf rockfish	
SPRW	SPOTTED PRAWN	Other nongroundfish	Other nongroundfish	
SQID	UNSP. SQUID	Other nongroundfish	Other nongroundfish	
SQR1	NOM. SQUARESPOT	Minor shelf rockfish	Minor shelf rockfish	
SQRS	SQUARESPOT ROCKFISH	Minor shelf rockfish	Minor shelf rockfish	
SRFP	SURFPERCH SPP.	Other nongroundfish	Other nongroundfish	
SRKR	SHORTRAKER ROCKFISH	Minor slope rockfish	Minor slope rockfish	
SSCL	SHARPNOSE SCULPIN	Other nongroundfish	Other nongroundfish	
SSDB	SPECKLED SANDDAB	Other non-FMP flatfish	Other non-FMP flatfish	
SSHR	SOUTHERN NEAR-SHORE RK	Southern nearshore rockfish	Deeper nearshore rockfish	yes
SSHR	SOUTHERN NEAR-SHORE RK	Southern nearshore rockfish	Shallow nearshore rockfish	yes
SSLF	SOUTHERN SHELF ROCKFISH	Minor shelf rockfish	Minor shelf rockfish	
SSLP	SOUTHERN SLOPE ROCKFISH	Minor slope rockfish	Minor slope rockfish	
SSO1	NOM. SAND SOLE	Other flatfish	Other flatfish	
SSOL	SAND SOLE	Other flatfish	Other flatfish	
SSP1	NOM. SHORTSPINE THORNYHEAD	Shortspine thornyhead	Shortspine thornyhead	
SSPN	SHORTSPINE THORNYHEAD	Shortspine thornyhead	Shortspine thornyhead	
SSRD	Deep So. Nearshore RF	Southern nearshore rockfish	Deeper nearshore rockfish	yes
SSRK	SOUPFIN SHARK	Other groundfish	Other groundfish	
SSRS	Shallow So. Nearshore RF	Southern nearshore rockfish	Shallow nearshore rockfish	yes
STAR	STARRY ROCKFISH	Minor shelf rockfish	Minor shelf rockfish	
STL1	NOM. STRIPETAILED ROCKFISH	Minor shelf rockfish	Minor shelf rockfish	
STLH	STEELHEAD	Other nongroundfish	Other nongroundfish	
STNA	SKIPJACK TUNA	Other nongroundfish	Other nongroundfish	
STR1	NOM. STARRY ROCKFISH	Minor shelf rockfish	Minor shelf rockfish	

PacFIN Species ID	PacFIN Common Name	Species Group - North of 40° 10' N latitude	Species Group - South of 40° 10' N latitude	NS Species
STRK	STRIPETAILED ROCKFISH	Minor shelf rockfish	Minor shelf rockfish	
STRY	STARRY FLOUNDER	Starry flounder	Starry flounder	
SUSF	SOU. UNSP. SHELF ROCKFISH	Minor shelf rockfish	Minor shelf rockfish	
SUSP	SOU. UNSP. SLOPE ROCKFISH	Minor slope rockfish	Minor slope rockfish	
SUSR	SOU. UNSP. NEAR-SHORE RK	Southern nearshore rockfish	Deeper nearshore rockfish	yes
SUSR	SOU. UNSP. NEAR-SHORE RK	Southern nearshore rockfish	Shallow nearshore rockfish	yes
SWRD	SWORDFISH	Other nongroundfish	Other nongroundfish	
SWS1	NOM. SWORDSPINE ROCKFISH	Minor shelf rockfish	Minor shelf rockfish	
SWSP	SWORDSPINE ROCKFISH	Minor shelf rockfish	Minor shelf rockfish	
TCOD	PACIFIC TOMCOD	Other nongroundfish	Other nongroundfish	
TGR1	NOM. TIGER ROCKFISH	Minor shelf rockfish	Minor shelf rockfish	
THD1	NOM. THORNYHEADS	Mixed thornyheads	Mixed thornyheads	
THDS	THORNYHEADS (MIXED)	Mixed thornyheads	Mixed thornyheads	
TIGR	TIGER ROCKFISH	Minor shelf rockfish	Minor shelf rockfish	
TRE1	NOM. TREEFISH	Other minor nearshore rockfish	Deeper nearshore rockfish	yes
TREE	TREEFISH	Other minor nearshore rockfish	Deeper nearshore rockfish	yes
TSRK	COMMON THRESHER SHARK	Other nongroundfish	Other nongroundfish	
UABL	UNSPECIFIED ABALONE	Other nongroundfish	Other nongroundfish	
UCLM	UNSPECIFIED CLAM	Other nongroundfish	Other nongroundfish	
UCRB	UNSPECIFIED CRAB	Other nongroundfish	Other nongroundfish	
UDAB	UNSP. SANDDABS	Other flatfish	Other flatfish	
UDF1	UNSP. DEEP-91 FLOUNDERS	Other flatfish	Other flatfish	
UDF2	UNSP. DEEP-95 FLOUNDERS	Other flatfish	Other flatfish	
UDM1	UNSP. DEMERSAL-91	Other groundfish	Other groundfish	
UDNR	UNSP. DEEP NEAR-SHORE RF	Other minor nearshore rockfish	Deeper nearshore rockfish	yes
UDSR	UNSP. DEMERSAL RKFSH	Other groundfish	Other groundfish	
UDW1	SHORTRAKER+ROUGHEYE	Minor slope rockfish	Minor slope rockfish	
UECH	UNSPECIFIED ECHINODERM	Other nongroundfish	Other nongroundfish	
UFL1	FLOUNDERS (NO FSOL)	Other flatfish	Other flatfish	
UFLT	UNSP. FLATFISH	Other flatfish	Other flatfish	
UGRN	UNSP. GROUND FISH	Other groundfish	Other groundfish	
UHAG	UNSPECIFIED HAGFISH	Other nongroundfish	Other nongroundfish	
UHLB	UNSPECIFIED HALIBUT	Other nongroundfish	Other nongroundfish	
UJEL	UNSP. JELLYFISH	Other nongroundfish	Other nongroundfish	
UKCR	UNSP. KING CRAB	Other nongroundfish	Other nongroundfish	
UMCK	UNSP. MACKEREL	Other nongroundfish	Other nongroundfish	
UMSK	UNSPECIFIED MOLLUSKS	Other nongroundfish	Other nongroundfish	
UPLG	UNSP. PELAGIC RKFSH	Other groundfish	Other groundfish	
UPOP	UNSP. POP GROUP	Pacific ocean perch	Minor slope rockfish	
URCK	UNSP. ROCKFISH	Minor slope rockfish	Minor slope rockfish	
URCK	UNSP. ROCKFISH	Minor shelf rockfish	Minor shelf rockfish	
URK1	SRKR+REYE+NRCK+SHRP	Minor slope rockfish	Minor slope rockfish	
URND	UNSP. ROUND FISH	Other groundfish	Other groundfish	
USCL	UNSPECIFIED SCALLOP	Other nongroundfish	Other nongroundfish	
USCU	UNSP. SEA CUCUMBERS	Other nongroundfish	Other nongroundfish	
USF1	UNSP. SHALLOW-91 FLOUNDERS	Other flatfish	Other flatfish	

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

Filename: PacificHalibut_TotalMortality2010_FinaDraft_082510.doc
Directory: C:\DOCUME~1\MAJEWS~1\LOCALS~1\Temp
Template: C:\Documents and Settings\majewskija\Application
Data\Microsoft\Templates\Normal.dotm
Title: Fixed Gear
Subject:
Author: Eliza Heery
Keywords:
Comments:
Creation Date: 8/25/2010 1:18:00 PM
Change Number: 4
Last Saved On: 8/25/2010 1:26:00 PM
Last Saved By: Eliza Heery
Total Editing Time: 12 Minutes
Last Printed On: 9/1/2010 9:49:00 AM
As of Last Complete Printing
Number of Pages: 70
Number of Words: 19,471 (approx.)
Number of Characters: 113,712 (approx.)