

**Data Report and Summary Analyses
of Sablefish-Endorsed Fixed-Gear Permits
West Coast Groundfish Observer Program**

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Photo: NOAA Fisheries

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INTRODUCTION

Overview

This report summarizes discarded catch data collected by the West Coast Groundfish Observer Program (WCGOP) from the limited-entry (LE) sablefish-endorsed fixed-gear fishery from January 1, 2005 through December 31, 2005. The WCGOP collects at-sea data from limited-entry trawl and fixed-gear fisheries, as well as from open access nearshore, prawn/shrimp, California halibut, and deep-water fisheries. The WCGOP's goal is to improve total catch estimates by collecting information on the discarded catch (fish returned overboard at-sea) of west coast groundfish species. The data is used in assessing and managing a variety of groundfish species.

West Coast Fixed-Gear Sablefish Fishery

The LE sablefish-endorsed fixed-gear fishery is a subset of the limited-entry fixed-gear permits. The fishery operates primarily out of Oregon and Washington ports. There were 230 LE fixed-gear permits in 2005, of which 164 have a sablefish-endorsement. LE fixed-gear permits are also associated with a gear type, either longline or pot/trap. Of the 164 sablefish-endorsed permits, 136 are associated with longline gear and 28 are associated with pot/trap gear. Sablefish-endorsed permits provide the permit holder with an annual share of the sablefish catch allocated to the primary fishery for fixed-gear permits. Sablefish-endorsed permits are assigned to Tier 1, 2 or 3. Of the 164 sablefish-endorsed permits, 28 are assigned to Tier 1, 42 to Tier 2, and 94 to Tier 3. Each Tier 1 permit receives 1.4% of the fishery allocation, with Tiers 2 and 3 receiving 0.64% and 0.36%, respectively. Each year, these shares are translated into amounts of catch (in pounds), or "tier limits", which may be caught during the primary fishery. In the 2005 season, initially these shares were translated into tier limits of 64,000 pounds for Tier 1, 29,100 pounds for Tier 2, and 16,600 pounds for Tier 3 (69 FR 77012).

Regulations allow for up to three sablefish-endorsed LE permits to be 'stacked' on a single vessel. Permit stacking was implemented to increase the economic efficiency of the fleet and promote fleet capacity reduction. Stacking more than one sablefish-endorsed permit on a vessel allows the vessel to land sablefish up to the sum of the associated tier limits. For example, using 2005 tier limits, a vessel with a Tier 1 permit which bought or leased an additional Tier 2 and a Tier 3 permit could land a total of 109,700 lbs of sablefish during the primary fishery (Tier 1 + Tier 2 + Tier 3 = 64,000 + 29,100 + 16,600 lbs). However, permit stacking does not convey additive landing limits for any other species, nor for sablefish when caught under the daily/weekly option. The catch of sablefish landed by vessels without a sablefish endorsement, outside the sablefish season, or who have met their quota is restricted by daily/weekly limits.

Vessels participating in the sablefish-endorsed fishery range in size from 33 to 95 feet and fish from April 1 to October 31. Fishing generally occurs in depths greater than 80 fathoms, and may be restricted to even greater depths under evolving fishery management. Nearly all of the vessels participating in this fishery deliver their iced catch to shoreside processors. Catch in the sablefish-endorsed fishery is composed mostly of sablefish with bycatch primarily composed of spiny dogfish shark, Pacific halibut, rockfish species, and skates. Vessels retain and deliver to processors the portion of catch that is marketable and permitted to be landed. The portion of their catch which is not marketable or for which regulations prohibit landing is discarded at-sea. In addition to market and regulatory discard, smaller fish may sometimes be discarded, as fishermen seek to maximize the value of their landed catch allowances.

The primary sablefish fishery currently takes place over a seven-month season from April 1 to October 31. The seven-month season was first implemented in 2002. During 2001, the season was open from August 15 to October 31. For several years prior to 2001, tier limits were assigned, but they could only be fished during a roughly 10-day window. Any primary season poundage left uncaught would then be divided into equal limits that were available to permitted vessels during a two-week “mop-up” fishery. Permit holders can now land their tier limits at anytime during the seven-month season. Once the primary season opens, all sablefish landed by a sablefish-endorsed permit is counted toward attainment of its tier limit.

Fisheries managers and enforcement officers use state-issued sales receipts, referred to as fish tickets, to monitor fishery landings. This information is transferred to the Pacific Coast Fisheries Information Network (PacFIN) regional database system by state fishery agencies in Washington, Oregon, and California. Fish tickets are used to ensure that each vessel’s landings during the primary sablefish fishery do not exceed the sum of the vessel’s tier limits. Unlike the LE groundfish trawl fleet, vessel logbooks are neither required nor routinely collected for the fixed-gear fleet. Fish tickets only provide information on the amount of fish landed. In order to ensure that total catch does not exceed annual Optimum Yield (OY), managers also need discard information for each managed species. One of the best means of acquiring accurate data needed to estimate the amount of discarded catch is through an at-sea observer program.

West Coast Groundfish Observer Program

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

Program Goals

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

METHODS

Permit Selection Process for Sablefish-Endorsed Limited-Entry Permits

LE sablefish-endorsed fixed-gear permits are selected for observation using stratified random sampling. First, the WCGOP determines the amount of time (based on available resources) it will take to observe the entire fleet; this is termed the selection cycle. The selection cycle varies due to changing priorities and observer resources. Because of the data and timeline requirements for fisheries managers and historical observer program vessel coverage, the selection cycles do not coincide with the date range of the observer data analyzed in this report. The data in this report were collected during the selection cycle from January 1, 2005 through December 31, 2006 (selection cycle 2). In the current selection cycle, there are 164 LE fixed-gear permits with a sablefish endorsement.

	2005												2006																				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec									
Selection Cycle	Selection Cycle 2																																
Report Data	Date Range of Report Data																																

The WCGOP aggregates locations along the US west coast into port groups, which are considered strata. Vessels with LE sablefish-endorsed fixed-gear permits are assigned to a port group based upon the location of the previous year’s landings. Within each port group, vessels are randomly selected for coverage during their primary sablefish season. After the entire fleet has been selected, a new selection cycle begins. This selection process is designed to produce a logistically feasible sampling plan with a distribution of observations throughout the entire geographic range of the fishery. Based on this design and the current level of WCGOP funding, the program is currently cycling through the LE sablefish-endorsed fixed-gear fleet every two years.

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

Vessel Coverage

LE fixed-gear permits are the second highest priority for the WCGOP and most trips taken by a vessel whose permit is selected are covered by an observer. LE sablefish-endorsed vessels are selected for all trips during their primary sablefish season. Thus, all trips in which a selected vessel lands catch quota against a tiered sablefish permit are required to have observer coverage.

However, some vessels whose permits are selected for the primary sablefish season may not be covered by an observer during that period or may not be covered on all trips during that period. Single trips may be waived from observer coverage due to observer availability, a safety issue that can be fixed in a relatively short period of time, or vessel space issues that arise when an extra person is aboard. A few LE sablefish-endorsed vessels are given selection cycle waivers. A selection cycle waiver allows the vessel to fish without an observer during all trips taken during the entire selection cycle. Selection cycle waivers are given when a vessel has a serious safety concern that cannot be easily remedied or if the vessel is too small or space is too limiting to safely carry an observer.

Some vessels may receive a coverage period waiver. Coverage period waivers allow a vessel to fish all trips during the primary sablefish season without an observer. Coverage period waivers are given for a variety of reasons including vessel size/space constraints, observer availability, and vessel safety. Vessels are given a coverage period waiver for a specific sablefish season and are added to the selection list for the next sablefish season. For instance, if a vessel is given a coverage period waiver for January 1 through December 31, 2005 that vessel is automatically selected for observer coverage for the period January 1 through December 31, 2006. Vessels continue to be added to the subsequent selection list until either an observer covers them or until the selection cycle ends, whichever comes first.

Complications in Selecting Sablefish-Endorsed Permits

Until a primary season sablefish landing has been made on a sablefish-endorsed permit, the permit can be transferred to any other fixed-gear vessel. This flexibility, combined with the benefits from permit stacking, results in greater inter- and intra-year movement of permits between fixed-gear vessels than is observed in the LE trawl fleet. As mentioned previously, a LE fixed-gear vessel participating in the sablefish-endorsed fishery can have up to three tier permits stacked on it. This environment can lead to several difficulties for observer data collection, including tracking the activities and coverage of both permits and vessels as well as attributing landings to a specific permit when stacking does occur.

Allowing permits to move from vessel to vessel throughout the year complicates permit selection. Therefore, tracking of which vessel a permit is assigned to requires continuous monitoring. Although

permit transfers are tracked through the NOAA Fisheries Permits Office at the Northwest Regional Office, the WCGOP has limited resources to monitor these changes throughout the season. So, while permit owners are initially contacted before the season begins regarding their selection for coverage, their permits can still be transferred to different vessels anytime before they are used to land tier-limit sablefish. In response to this situation, the observer program has adopted a policy of observing whichever vessel a selected permit is eventually fished on, even though that vessel may land fish into a different port group.

A second complication of permit selection occurs when tier permits are stacked. When fish are landed by a vessel that has multiple permits attached to it, there is no requirement to associate all or part of the poundage with a specific permit. Consequently, if a vessel has a mix of selected and unselected permits attached to it, all tier-limit trips must be observed, in order to ensure that the landings of selected permits have been covered. This leads to the following two complications: 1) unselected permits receive coverage and 2) permits are selected a second time before other permits are covered a first time.

As an example of the first complication, a vessel with a Tier 1 and a Tier 2 permit stacked could land a total of 90,000 pounds of sablefish in 2004. If only the Tier 1 permit were selected for observer coverage, it would still be necessary to observe all primary season landings, up to 90,000 pounds, to ensure that all of the Tier 1 permit landings had been observed. This interferes with the assumption that the permit selection is a simple random sample of available permits due to the concurrent coverage of a permit that was not selected.

As an example of the second complication, suppose that the unselected Tier 2 permit in the example above was in fact observed, along with the Tier 1 permit during 2004. Following the primary sablefish season, the Tier 2 permit might remain on the same vessel or might be transferred to another vessel for the 2005 fishery. In either case, it might be selected for coverage in 2005, which would result in its landings having been observed in two consecutive years. In such circumstances where a permit has been previously covered, though not selected, the WCGOP has adopted the following policy:

- Observe the permit if it is attached to a vessel not previously observed for the primary fishery during the current cycle;
- Do not observe the permit if it is attached to a vessel that has been observed for the primary fishery during the current cycle.

Fixed-Gear Data Collection

Fisheries observers are trained professionals who monitor and record catch data on commercial fishing vessels by following protocols in the WCGOP Manual (NMFS 2005a, current manual available at: <http://www.nwfsc.noaa.gov/research/divisions/fram/observer/observermanual/observermanual.cfm>).

Data collected by observers on a trip basis include:

- Start time, end time, and location of the set/retrieval of gear
- Gear type and fishing strategy
- Fish ticket identification numbers

Data collected by observers on a set basis include:

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

For more information regarding observer sampling on LE sablefish-endorsed fixed-gear vessels, refer to the WCGOP Observer Training Manual, Chapter 5 – Fixed Gear Sampling at: <http://www.nwfsc.noaa.gov/research/divisions/fram/observer/observermanual/observermanual.cfm>.

Data Quality Control and Management

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

Data are collected at-sea by the observer following protocols in the WCGOP Manual (NMFS 2005a).

Data are entered into the database system. The data are entered into a centralized Oracle database located at the Northwest Fisheries Science Center (NWFSC). Data within the Oracle database are accessible via a web-based GUI or by direct SQL queries to the database. A list of data tables is located in Appendix A.

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

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

Observer Logbook Review - Observers keep logbooks detailing the events of each trip, basic deck schematics, sampling methods used, communication logs, and confirmation of

a current safety decal. Any tows during which sampling problems occurred are documented in the logbook and reviewed during debriefing.

Interview – The observer is interviewed by the debriefer. During the interview, sampling methodologies employed on all trips are discussed and data errors are updated.

Evaluation - Observers are evaluated on their performance based upon WCGOP generated criteria.

Data Entry Check - Electronic data are compared to the raw data for keypunch errors. Also, all corrections discovered during debriefing are updated in the database program.

Database Quality Control Queries - Quality control queries are run to detect data that fall outside specified ranges and identify other inconsistencies between data elements. These database quality control queries are run every six months to a year on all data collected during a specified time period.

Database Update - The raw data from all entries that are highlighted by the QC queries are reviewed and the electronic data are updated.

Finally, data are then considered complete and are released to the analyst.

Data Processing

After quality control, WCGOP data are processed and merged with fish ticket data to provide more accurate estimates of bycatch. First, the subsamples of catch categories are expanded to the entire catch category at the set level. Second, the WCGOP data are then matched to fish tickets and the observer estimates of total weight of the retained catch categories are adjusted to match the fish tickets weight. Fish tickets are completed by processors and include the actual weight and composition of fish landed. Finally, the catch categories found only on the fish tickets (but not in observer data) are distributed across the sets by multiplying the weight in the catch category by the percent weight of the observed catch in each set.

A set-level expansion is needed to estimate the total retained and discarded weight for each species because of the sampling procedure that derives the species composition. If the species composition of a catch category is mixed, an observer may take a subsample from the catch category. The following equation is used to calculate the weight of the subsample by summing across the observed weights of the individual species:

$$w_j = \sum_i x_{ij}$$

where

x_{ij} = observed weight of the species i in catch category j in the subsample,

w_j = weight of the subsample from catch category j .

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

$$R_j = w_j / y_j$$

where

y_j = the total weight of catch category j .

The set-level expanded weight of species i in category j is calculated by dividing the species weight in the subsample by the sampling ratio in the following equation:

$$X_{ij} = x_{ij} / R_j$$

where

X_{ij} = the weight of species i in catch category j .

Tallying the weight (X_{ij}) of the species (i) across all categories (j) within a set provides the total weight of the species retained or discarded.

Fish tickets are trip-aggregated sales receipts for marketable species/categories. Fish ticket information is uploaded from state databases into the regional PacFIN database on a monthly basis and is subject to update frequently thereafter. The WCGOP data are linked to fish tickets by direct fish ticket number(s) obtained by the observer and/or by comparing the return date recorded by the observer with the dates of fish tickets from the vessel. For trips with multiple fish tickets, the fish ticket data are combined for analysis purposes. For trips with missing fish tickets, the WCGOP data are not adjusted.

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

$$A_{jkm} = x_{jkm} / \sum_k x_{jkm}$$

where

x_{ikm} = lbs in catch category j in set k in trip m

A_{jkm} = adjustment factor used for catch category j in set k in trip m .

The equation used to adjust the WCGOP data is:

$$x'_{jkm} = A_{jkm} \cdot C_{jm}$$

where

C_{jm} = lbs in catch category j for trip m recorded on the fish ticket.

When a catch category in the WCGOP data cannot be matched to a fish ticket species category, the WCGOP data are not adjusted.

Catch categories found only on the fish tickets were distributed across the sets using the proportion of the observed catch per set divided by the total observed catch per trip using the following equation:

$$B_{km} = \text{Total weight per set} / \text{Total weight per trip} = \sum_j \sum_i x_{ijkm} / \sum_k \sum_j \sum_i x_{ijkm}$$

$$C_{jkm} = B_{mk} \cdot C_{jm}$$

where

B_{km} = the proportion of observed catch in set k in trip m

C_{jkm} = lbs in catch category j for set k in trip m recorded on the fish ticket.

Analysis

Bycatch rates were calculated for a particular species as pounds per unit effort, pounds discarded per one-hundred pounds of sablefish retained, and pounds caught (retained plus discarded) per one-hundred pounds of retained sablefish. The ratio estimator technique (Cochran 1977) was used to estimate by-catch and discard rates for 35 selected species or species groups. The fish species selected for estimation were all overfished stocks, prohibited species (salmon, Pacific halibut), and other assessed stocks. The ratio estimates (R_{ijk}) were calculated by area (i) and depth range (j):

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

where y_{ijt} is the discarded or retained pounds of a species in the set t .

Three denominators (x_{ijt}) are presented here: duration in hours of the sampled set t , total catch in pounds of the target species, and total catch of all groundfish in the set t . The first denominator is an unstandardized catch-per-unit-effort for the area-depth stratum. The second and third denominators are used to provide different perspectives for these preliminary analyses. The variance of R_{ij} is approximated by using the following equation (Cochran 1977):

$$\text{Var}(R_{ij}) = \frac{1}{n} \left(\frac{\bar{y}_{ij}}{\bar{x}_{ij}} \right)^2 \left[\frac{s^2(y_{ijt})}{\bar{y}_{ij}^2} + \frac{s^2(x_{ijt})}{\bar{x}_{ij}^2} - 2 \left(\frac{\sum_t (y_{ijt} - \bar{y}_{ij})(x_{ijt} - \bar{x}_{ij})}{\bar{y}_{ij} \bar{x}_{ij}} \right) \right]$$

where

\bar{x}_{ij} and \bar{y}_{ij} are the means of x_{ijt} and y_{ijt} over the sets and $s(x_{ijt})$ and $s(y_{ijt})$ are the standard errors of x_{ijt} and y_{ijt} .

Note that $\text{Var}(R_{ij})$ cannot be calculated when $y_{ijt} = 0$ or $x_{ijt} = 0$ for all sets and should be used with extreme caution when R_{ij} is equal to one. This variance estimator was chosen in place of the previously used estimator from Pikitch et al. (1998) because the estimator from Cochran (1977) does not assume independence of the numerator and denominator.

RESULTS AND DISCUSSION

Observed and unobserved sablefish catch landed (in metric tons) against tier limits during the 2005 primary fixed-gear sablefish season is listed in Table 1. Observer coverage in 2005 relative to 2004 (calculated from weight of landed catch), increased in the longline sector from 13% to 38% and increased in the pot gear sector from 15% to 46%. This represents a substantial increase in observer coverage within this fishery, in part due to reducing the selection cycle length from four to two years. In addition, permits move around among vessels and may contribute to variability in the coverage levels. Table 2 summarizes the observer coverage of all groundfish catch (other than sharks and skates) that were landed from tier-limit sablefish trips.

The number of sablefish tier-limit trips and sets observed during the 2005 season are summarized in Tables 3 and 4. Table 3 reports the distribution of observed trips among port groups. Overall, the majority of observed trips landed fish in the port groups of Astoria, Newport, Coos Bay, and Crescent City. Table 4 summarizes the number of sets that were observed by general depth strata. During 2005, the vast majority of observed sets occur deeper than 100 fm north of 40° 10' N latitude and deeper than 150 fm south of 40° 10' N latitude. The few sets in shallow waters were close to the threshold for deep versus shallow strata; thus the data were not separated into depth strata for the discard calculations in this report.

It is important to note that the WCGOP controls only the selection of permits for coverage. Fishing activity of the selected vessels can vary in unpredictable ways. Therefore, the program cannot control the percentage of landings or trips that are actually observed. Also, the current sampling protocol does not separate longline from pot/trap permits. As a result, coverage levels within each gear type, particularly within a port group, may vary from year to year depending on which permits are selected.

Amounts and rates of discard for 22 species or species groups encountered during observed sets are summarized in Table 5. For each species, the decision to discard is dependent not only upon levels of cumulative retained catch and corresponding landing limits, but also upon the size, condition, and marketability of the fish. For many marketable species, such as thornyheads and sablefish, retention rates are generally high. Canary and yelloweye rockfish on a coast-wide basis and bocaccio rockfish in the south had no retention, as a result of management measures to prevent targeting of overfished species. Only 5 pounds of widow rockfish were observed in one pot set and cowcod rockfish were not caught

during any of the observed sets. In the case of Pacific halibut, most vessels had low retention.

Bycatch ratios for overfished species caught during observed sets in 2005 are summarized in Table 6 by gear type and area. Bycatch ratios were not stratified by depth because all of the sets occurred in deeper water or close to the depth strata threshold. Bycatch ratios are the total weight caught of each species per one-hundred pounds of retained sablefish. In 2005, bycatch ratios of bocaccio rockfish, dark-blotched rockfish, lingcod, and Pacific ocean perch increased from 2004 levels (NMFS 2005b). In contrast, bycatch ratios of canary and yelloweye rockfish decreased in 2005 relative to 2004.

Table 7 reports three measures of species discard and their associated standard errors for 35 species from observed sets. The first measure is the percentage of a species that was discarded from the total catch of that species. This is the same measure as reported in Table 5. The second measure reflects discard per unit of effort. For longline gear, effort is calculated as the duration of a set in hours per number of hooks set divided by 1,000. For pot gear, effort is calculated as the duration of a set in hours per number of pots set divided by 10. The third measure relates discarded poundage of each species per one-hundred pounds of retained sablefish. In the longline gear sector, discard rates expressed in both per unit of effort and by retained sablefish were higher for arrowtooth flounder, Pacific halibut, and sablefish. More moderate discard rates in this sector were observed for the categories of other roundfish, other shelf rockfish, other slope rockfish, lingcod, dover sole, and blackgill rockfish in the south. The highest discard rates in the pot gear sector were for sablefish, Pacific halibut, arrowtooth flounder, and lingcod.

The majority of sets had little or no discard of shortspine thornyheads, bocaccio rockfish, canary rockfish, yelloweye rockfish, darkblotched rockfish, cowcod rockfish, or widow rockfish as displayed in Figures 1-4. Lingcod discard per set was observed at a moderate level. The highest levels of discard per set are for Pacific ocean perch and sablefish as displayed in Figures 1 and 5. The percentage of sets which had over 150 pounds of sablefish discard in 2005 was 28%, which is a decrease from 36% in 2004.

It is expected that results from the 2005 WCGOP coverage presented in this report will be used in the fishery management process. When combined with additional sources of fishery information, these results can improve total catch estimates for west coast groundfish fisheries.

It is expected that results from the 2005 WCGOP coverage presented in this report will be used in the fishery management process. When combined with additional sources of fishery information, these results can improve total catch estimates for west coast groundfish fisheries.

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APPENDIX A. Oracle Database

Database Table Hierarchy

TRIPS

- ▶ FISHING_ACTIVITIES
 - ▶ FISHING_LOCATIONS
 - ▶ CATCHES
 - ▶ SPECIES COMPOSITION
 - ▶ SPECIES_COMPOSITION_ITEMS
 - ▶ BIO_SPECIMENS
 - ▶ BIO_SPECIMEN_ITEMS
 - ▶ DISSECTIONS

Database Table Descriptions

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

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