Data Report and Summary Analyses of Fixed-Gear Fisheries in Waters Less Than 50 Fathoms

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 nearshore fixed-gear fisheries from January 1, 2006 through April 30, 2007. The WCGOP collects at-sea data from limited-entry (LE) 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 at-sea) of west coast groundfish species. The data is used in assessing and managing a variety of groundfish species. This report focuses on the nearshore fishery.

West Coast Nearshore Fishery

The US west coast nearshore groundfish commercial fleet operates from southern California to northern Oregon. Historically, nearshore fisheries were accessible to everyone. However, due to the ever increasing number of participants and concerns of overcapacity, California and Oregon began requiring state issued permits in 2003 and 2004, respectively. Regulations for the nearshore fisheries are set by both the Pacific Fisheries Management Council (PFMC) and the states.

The Pacific Fisheries Management Council sets the optimum yield (OY) for groundfish species, including nearshore species, on a coastwide basis. The coast is divided into two distinct management areas: north of 40°10' N. latitude and south of 40°10' N. latitude. The commercial fishery has two sectors, the limited entry sector which requires federally issued permits and the open access sector, which does not require federally issued permits. Vessels that participate in the nearshore fishery can belong to either sector.

In addition to regulations set by the PFMC, each state manages its nearshore fishery independently by issuing state regulations on the cumulative trip limits of nearshore species in their state waters. Cumulative trip limits are a specified weight of fish that can be landed during a time period, usually two-months. Often, cumulative trip limits set by the states are more restrictive than the federal limits.

Vessels participating in the nearshore fishery range in size from 10 to 50 feet and average approximately 25 feet. They use a variety of fixed gear including hand-lines, cable gear, fishing poles, and pots. The majority of fishing in shallow water (< 50 fathoms) north of 40°10' N. latitude occurs between Port Orford, Oregon and Crescent City, California. In general, black rockfish and blue rockfish are the principal targets, along with cabezon, kelp greenling and multiple other nearshore species. However, depending on a vessel's endorsement (permit-type), the principal target can vary. For example, in Oregon, black rockfish and blue rockfish are the principal target of the 'Black/Blue rockfish' permitted

vessels while kelp greenling, cabezon and other nearshore rockfish (principally China rockfish) are the principal targets of the 'Nearshore rockfish endorsed' permitted vessels. The nearshore fishery south of 40°10' N. latitude also targets a wide variety of species, including California sheephead, cabezon, kelp greenling, and an array of nearshore rockfish species.

In shallow water, fishers often fish in coves or drift along a reef. They set and retrieve their gear multiple times a day and generally land their fish on a daily basis. Quotas for the nearshore fishery are small; generally between 100 to 2,000 lbs every two months. Many of those who fish in shallow water participate in the live fish market, necessitating careful handling of retained fish. They sell the live fish for as much as $8 per pound to restaurants or other vendors. These vessels retain only the portion of their catch that is marketable and permitted to be landed. The portion of catch which is not marketable or which regulations prohibit from landing is discarded at-sea. As this is a very market driven fishery, fishers may discard certain size fish or dead fish to maximize the value of their landed catch. Fishers endeavor to discard individuals gently, attempting to release them alive.

California

California licenses individuals for commercial fishing, including individuals who participate in the nearshore fisheries. The state issues two permits for fishing within the nearshore area: the Deep Nearshore permit and the Shallow Nearshore permit. Fishers can either have a permit for just one of the fisheries (Deep or Shallow) or for both of the fisheries. In 2006, there were a total of 445 California nearshore permits and in 2007, there were 427 permits. The Deep Nearshore permit is required for landing black rockfish, blue rockfish, brown rockfish, calico rockfish, copper rockfish, olive rockfish, quillback rockfish, and treefish. The Shallow Nearshore permit is required for landing black-and-yellow rockfish, cabezon, greenlings, California scorpionfish, California sheephead, china rockfish, gopher rockfish, grass rockfish, and kelp rockfish. Lingcod is also commonly targeted with Shallow Nearshore permit species. Most live fish landings consist of species in the Shallow Nearshore group.

California state management designates four geographic zones along the coastline; 1) the south coast: south of Point Conception (34°27' N); 2) the south-central coast: from Point Conception (34°27' N) to Point Ano Nuevo (37°07' N); 3) the north-central coast: from Point Ano Nuevo (34°27' N) to 40°10' N. latitude near Cape Mendocino; and 4) the north coast: from 40°10' North latitude to the Oregon-California border (42°00' N). There are a number of fishing area closures in both federal (3-200 miles offshore) and state (0-3 miles from the coastline) waters.

Oregon

Oregon licenses individuals for commercial fishing, including individuals who participate in the nearshore fishery. Oregon's nearshore commercial fishery (hook & line, pot and longline) typically occurs in the shallow water zone (≤ 30 fathoms) and targets species such as black rockfish, blue rockfish, china rockfish, copper rockfish, quillback rockfish, grass rockfish, cabezon and greenlings.

In 2006, Oregon issued 60 black/blue rockfish permits which allow for the landing of black rockfish and blue rockfish and 73 black/blue rockfish permits with a nearshore endorsement which allows landing of black rockfish and blue rockfish along with 21 other Oregon designated nearshore groundfish species. In 2007, Oregon issued 56 black/blue rockfish permits and 70 black/blue rockfish permits with a near-shore endorsement.

Washington

The State of Washington does not allow commercial fishing of nearshore species within its territorial waters (0-3 miles from the coastline). This prohibition removes nearly all fishing grounds shallower than 50 fathoms from access by commercial fishers.

Nearshore Fisheries Data

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 do not exceed the vessel's trip limits. California and Oregon have each instituted a nearshore logbook program. In 2004, Oregon began requiring that nearshore fishers complete these vessel logbooks. California instituted a voluntary nearshore logbook program in 2005. Fish tickets only provide information on the amount of fish landed. In order to ensure that total catch does not exceed annual OY, managers also need discard information for each managed species. One of the best means of acquiring accurate data needed to estimate the amount of discarded catch is through an at-sea observer program.

West Coast Groundfish Observer Program

On May 24, 2001, NOAA Fisheries (National Marine Fisheries Service, NMFS) established the WCGOP in accordance with the Pacific Coast Groundfish Fishery Management Plan (50 CFR Part 660) (66 FR 20609). This regulation requires all vessels that catch groundfish in the United States Exclusive Economic Zone (EEZ) from 3-200 miles offshore to carry an observer when notified to do so by NMFS or its designated agent. Subsequent state rule-making has extended NMFS' ability to require that California and Oregon vessels which only fish in the 0-3 mile state territorial zone to also carry observers. The program deploys observers 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 deployed observers in the limited entry 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, the WCGOP increased its existing coverage of the nearshore fishery. Currently, the WCGOP coverage goal is to maintain, at minimum, 20% coverage of the limited-entry trawl and fixed-gear fisheries while continuing to improve coverage in the open access fisheries.

METHODS

Permit Selection Process for the Nearshore Fishery

Permits/licenses are selected for observation using stratified random sampling. First, the WCGOP determines the amount of time (based on available resources) it will take to select 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 management 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 multiple selection cycles outlined in the table below (Table A).

Table A. *Observer Program Selection Cycles in the Nearshore Fishery*

	2006	2007											
	Jan - Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
CA Nearshore	Selection Cycle 5	Selection Cycle 6											
OR Black/Blue Rockfish	Selection Cycle 3	Selection Cycle 4											
OR Black/Blue Rockfish Nearshore	Selection Cycle 3	Selection Cycle 4											
Report Data	Data Range of Report												

Due to the high number of permits in these fisheries, conventions were developed to narrow down the lists to those permits that are most active in the nearshore fishery and to vessels that have sufficient space to carry an observer. This increases the probability that the vessels selected will be actively fishing and observable, thereby increasing the probability of getting observations in all geographical and temporal strata.

For all selection cycles in all nearshore fisheries, the following conventions were used to select vessels:

- Any vessel/permit holder that landed less than 1,000 lbs of rockfish during an 18-month period prior to the start of the selection cycle was excluded from the selection list.
- Any vessel/permit holder that did not use fixed-gear to catch nearshore species was excluded from the selection list.

- Any permit that was not assigned to a vessel was excluded from the selection list (Oregon fisheries only).
- Any vessel less than or equal to 17 feet was excluded from the selection list.

Therefore, the number of permits selected from each fishery was a subset of all permits in the fishery and varied for each selection cycle. The number of permits selected for CA Nearshore in selection cycle 5 was 129 and for selection cycle 6, 120 permits were selected. There were 36 OR Blue/Black Rockfish permits selected in selection cycle 3 and 30 in selection cycle 4. For OR Blue/Black Rockfish Nearshore, there were 53 permits selected in selection cycle 3 and 43 in selection cycle 4.

In selecting permits for coverage, the WCGOP aggregates ports along the US west coast into port groups, which are considered strata. Permits are assigned to a port group based upon the location of the previous year's landings. Within each port group, permits are randomly selected for coverage during a two-month period, which coincides with the two-month cumulative trip limit periods. After the entire fleet has been selected, a new selection cycle begins. This selection process is designed to produce a sampling plan with a distribution of observations throughout the entire geographic range of the fishery over time. Based on this design and the current level of WCGOP funding, the program is currently cycling through the California Nearshore, Oregon Black/Blue Rockfish, and Oregon Nearshore fleets every year.

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

Due to limited resources, the WCGOP prioritizes its deployment of observers. The program places a higher priority on observing higher volume limited-entry trawl and fixed-gear trips. As a result, when observers have had timing conflicts between trips of limited-entry and open access vessels, open access trips have been missed. Beginning in 2006, the nearshore fishery became the WCGOP's third highest priority, ahead of all other open access fisheries. The goal of increasing priority for the nearshore fishery is to cover more trips per vessel during a two-month period and to cover more vessels that participate in the fishery.

However, some vessels whose permits are selected for a specific two-month period may not be covered by an observer during that period or may not be covered on all trips during that period. 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. Some vessels may receive a coverage period waiver. Coverage period waivers allow a vessel to fish all trips during a two-month period without an observer. Coverage period waivers are given for a variety of

reasons, including vessel size/space constraints, observer availability, and vessel safety. Vessels are given a coverage period waiver for a specific two-month time period. These vessels are added to the selection list for the next two-month period. For instance, if a vessel is given a coverage period waiver for January 1 through February 28, that vessel is automatically selected for observer coverage for the period March 1 through April 30. Vessels continue to be added to the subsequent selection lists until either an observer covers them or until the selection cycle ends, whichever comes first.

A few open access 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. These issues may create some bias when trying to expand observer data to the entire fleet but cannot be avoided at this time. In the future, as alternative methods of monitoring these vessels become available, they will be applied.

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 (NWFSC 2006, 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 on observer sampling in the nearshore fixed-gear fleets, refer to the WCGOP Observer Manual, Chapter 6 – Fixed Gear Sampling on Small Boats 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:

1. Data are collected at-sea by the observer following protocols in the WCGOP Manual (NWFSC 2006).
2. 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 data base. A list of database tables is located in Appendix A.
3. Observers are debriefed by WCGOP staff after every two-month cumulative trip limit period. The debriefing includes:
   A. 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.
   B. 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 sets during which sampling problems occurred are documented in the logbook and reviewed during debriefing.
   C. Interview - The observer is interviewed by the debriefer. During the interview, sampling methodologies employed on all trips are discussed and data errors are updated.
   D. Evaluation - Observers are evaluated on their performance based upon WCGOP generated criteria.
   E. Data Entry Check - Electronic data are compared to the raw data for keypunch errors. Also, all corrections discovered during the debriefing are updated in the database program.
4. Database Quality Control Queries - Quality control queries are run to detect data that fall outside specified ranges and identify other inconsistencies between data elements. These database quality control queries are run every six months to a year on all data collected during a specified time range.
5. Database Update – The raw data from all entries that are highlighted by the QC queries are reviewed and the electronic data are updated.

Data Processing

Data processing includes the following steps: expand the subsample of species composition to the set-level; translate observer species codes to the appropriate PacFIN fish ticket data codes; identify and select the observer data records to match to fish tickets; query and process PacFIN fish ticket data associated with the nearshore fishery including the observed trips; and then merge observer data and fish ticket data. The translation of species codes results in a more seamless match with fish ticket data and provides information on observer coverage of overall fishery landings.

The WCGOP database administrator expands the subsamples of catch categories to the set level. In cases where the observer was only able to sample a portion of a set, a set-level expansion is needed to estimate the total retained and discarded weight. The following equation is used to calculate the weight of the retained and discarded catch of each species in a set:

$$X_i = x_i \frac{H}{h}$$

where

X_i = the calculated weight of species i in the set,

x_i = observed weight of the species i in the subsample,

h = the number of hooks sampled in a set,

H = the total number of hooks in a set.

Only the retained catch from trips with all sets sampled are required for the process of matching observer data to fish ticket data. The data records not required for matching the data to the fish tickets are removed from the data file for the matching process. The records that are removed and contain sampled catch data are added back into the data file prior to the coverage and discard rate analysis. Data that meets the following criteria are removed for the fish ticket matching process:

- Data where WCGOP data quality standards are not met. (These data are only used for the coverage rate analysis).
- Trips with sets where no retained or discarded information is recorded.
- Sets where observed total catch weight = 0.
- All discarded catch information. (These data are added back in for the discard analysis.)
- Trips where no fish ticket could be found. (These data are added back in for the coverage rate and discard rate analyses.)
- Partial trips (trips where the vessel was observed for less than 100% of their landed catch). (These data are added back in for the coverage rate and discard rate analyses.)

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

Once these two steps are completed, the retained catch records from the WCGOP data are merged with fish ticket data to provide more accurate estimates of retained catch.

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:

$$A_{jkm} = x_{jkm} \Big/ \sum_{k} x_{jkm}$$

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 are distributed across the observed sets using the proportion of the observed catch per set divided by the total observed catch per trip using the following equation:

$$B_{km} = \text{Total weight per set} \big/ \text{Total weight per trip} = \sum_{j}\sum_{i} x_{ijkm} \Big/ \sum_{k}\sum_{j}\sum_{i} x_{ijkm}$$

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

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.

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

Analysis

Bycatch rates were calculated for species weight (pounds) caught per one-hundred pounds of nearshore fish retained. The ratio estimator technique (Cochran 1977) was used to estimate bycatch rates for selected species. Fish species selected for bycatch rate calculation were all of the stocks currently managed under rebuilding plans. The ratio estimates (R_{ijkl}) are calculated by area (i), depth range (j), target strategy (k), and period (l):

$$R_{ijkl} = \sum_t y_{ijklt} \Big/ \sum_t x_{ijklt}$$

where

y_{ijklt} is the pounds of a species in set t.

x_{ijklt} is the retained pounds in set t of nearshore species (see Appendix B for details)

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

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

where

$\bar{x}_{ijk}$ and $\bar{y}_{ijk}$ are the means of x_{ijkt} and y_{ijkt} over the sets and

$s(x_{ijkt})$ and are the standard errors of x_{ijkt} and y_{ijkt}.

Note that Var (R_{ijk}) cannot be calculated when $y_{ijkt} = 0$ or $x_{ijkt} = 0$ for all sets and should be used with extreme caution when R_{ijk} 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

Overall Coverage Levels

Due to the logistical difficulties of observing the nearshore fisheries, observations in some port groups were limited. Low numbers of observations may lead to unbalanced sampling across ports or another important dimension of fishery participation, such as two-month period limits. Some areas or periods may have been more heavily covered than others, which may skew the analysis to the areas and periods of higher coverage.

Observed retained catch (in metric tons) from observed nearshore fixed-gear sets is reported in Table 1 by port group. Ports within each port group are detailed in Appendix C. During 2006, approximately

55% of the observed retained catch was landed in southern Oregon followed by ports in the Crescent City and the Astoria areas.

The number of observed trips, sets, and vessels in the nearshore fisheries are reported in Table 1 by port group. As with observed retained catch, the highest number of trips and sets occurred in southern Oregon, followed by the Crescent City and Morro Bay/Los Angeles areas. Port groups with fewer than 3 observed vessels were pooled to maintain confidentiality.

A comparison of observed retained catch and fish ticket landings is provided in Table 2 by species group. In 2006, observed catch of nearshore rockfish species was 10.5% for the area north of 40°10' N. latitude and 2.5% of the amount reported on fish tickets for the area south of 40°10' N. latitude. Observed catch of cabezon and kelp greenling was between 12% and 13% of fish ticket landings in the north and approximately 2% of fish ticket landings in the south. For California sheephead, which is not included in the Pacific Coast Groundfish Fishery Management Plan, observed catch was 0.5% of the amount reported on fish tickets in the south.

Starting in 2006, the observed retained catch was matched to fish ticket landings. In previous years, observer data was not matched to fish tickets due to partial observer coverage of the landings on a fish ticket and missing second fish ticket numbers. Some nearshore vessels fish a series of day trips prior to landing their catch and generating a fish ticket. Occasionally, an observer was only available for a portion of the series of day trips, resulting in only a portion of the landings on the fish ticket being observed. In the summer of 2005, the program recognized this issue and started to document occurrences of partial coverage. Sometimes the presence of a second fish ticket was not detected until data on the weight of observed retained catch was compared to the weight of catch on the fish ticket. Observer retained catch was substantially greater than the landed weight recorded on fish ticket(s) indicating that there may be an additional fish ticket associated with a trip. Prior to 2006, the combination of the possibility of an undetected second fish ticket with the inability to determine when a fish ticket was only partially observed made matching observed landings to fish ticket landings problematic.

Table 3 provides a summary of the distribution of observed sets, adding the dimension of depth to the area stratification of Table 1. Over 95% of observed sets occur in depths less than 20 fathoms. In 2006, the majority of observed sets occurred in depths less than 10 fathoms; while in early 2007, the majority of observed sets occurred in 11 to 20 fathoms.

Discard Estimates

Table 4 summarizes observed weights and rates of discard for nearshore species categories. Discarded and retained weight is reported for three depth intervals by area. In the north, observed discard of black

rockfish was less than 7% of total black rockfish catch in all strata. For other species categories, generally less than 30% of the amount caught was discarded in 2006. Lingcod was the exception in the north, with discard rates ranging from 16% to 46% in 2006 between depth strata. In the south, overall discard percentages were generally less than 50% for the species categories summarized. Higher rates were observed for kelp greenling and lingcod. It is important to note that these rates are for total discards but they do not represent mortality from discards. Mortality of discards will likely vary by species and the depth at which fish are caught.

Table 5 provides a similar summary of discarded and retained weight of rebuilding species, by area and depth. No cowcod rockfish, Pacific ocean perch, or darkblotched rockfish were caught in observed sets. Bocaccio rockfish were only observed in the south. The majority of observed nearshore sets discarded little or no widow rockfish, canary rockfish, bocaccio rockfish, or yelloweye rockfish. It is noted that the discard rates for canary and yelloweye rockfish are the result of a prohibition on retention of these species.

Bycatch rates of rebuilding species are provided in Table 6 by area and depth. No cowcod rockfish, Pacific ocean perch, or darkblotched rockfish were caught on observed sets with nearshore species. Generally, bycatch ratios increased with depth for the rebuilding species, which is expected, given their depth distributions.

The observer coverage of nearshore fisheries in California and Oregon provides a valuable look at bycatch and discarding practices in the nearshore groundfish fishery. It also provides information on how best to expand our observations in this fleet. However, given the limitations of observing many of the smaller vessels in this fishery, caution should be exercised in applying the results summarized in this report to the nearshore fleet as a whole. The goal of the observer program is to continue to expand the observations on this fleet.

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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

APPENDIX B. Nearshore Species Groups

PacFIN Species Identification	PacFIN Common Name	Nearshore Target Category North of 40° 10' N. Lat.		Nearshore Target Category South of 40° 10' N. Lat.	
BLCK	BLACK ROCKFISH	Black Rockfish	North	Black Rockfish	South
BLK1	NOM. BLACK ROCKFISH	Black Rockfish	North	Black Rockfish	South
BLU1	NOM. BLUE ROCKFISH	Blue Rockfish	North	Deeper Nearshore Species	South
BLUR	BLUE ROCKFISH	Blue Rockfish	North	Deeper Nearshore Species	South
BRW1	NOM. BROWN ROCKFISH	Other Nearshore Rockfish	North	Deeper Nearshore Species	South
BRWN	BROWN ROCKFISH	Other Nearshore Rockfish	North	Deeper Nearshore Species	South
BYEL	BLACK-AND-YELLOW ROCKFISH	Other Nearshore Rockfish	North	Shallow Nearshore Species	South
BYL1	NOM. BLACK-AND-YELLOW ROCKFISH	Other Nearshore Rockfish	North	Shallow Nearshore Species	South
CBZ1	NOM. CABEZON	Cabezon	North	Cabezon	South
CBZN	CABEZON	Cabezon	North	Cabezon	South
CHN1	NOM. CHINA ROCKFISH	Other Nearshore Rockfish	North	Shallow Nearshore Species	South
CHNA	CHINA ROCKFISH	Other Nearshore Rockfish	North	Shallow Nearshore Species	South
CLC1	NOM. CALICO ROCKFISH	Other Nearshore Rockfish	North	Deeper Nearshore Species	South
CLCO	CALICO ROCKFISH	Other Nearshore Rockfish	North	Deeper Nearshore Species	South
COP1	NOM. COPPER ROCKFISH	Other Nearshore Rockfish	North	Deeper Nearshore Species	South
COPP	COPPER ROCKFISH	Other Nearshore Rockfish	North	Deeper Nearshore Species	South
GPH1	NOM. GOPHER ROCKFISH	Other Nearshore Rockfish	North	Shallow Nearshore Species	South
GPHR	GOPHER ROCKFISH	Other Nearshore Rockfish	North	Shallow Nearshore Species	South
GRAS	GRASS ROCKFISH	Other Nearshore Rockfish	North	Shallow Nearshore Species	South
GRS1	NOM. GRASS ROCKFISH	Other Nearshore Rockfish	North	Shallow Nearshore Species	South
KGL1	NOM. KELP GREENLING	Kelp Greenling	North	Kelp Greenling	South
KLPG	KELP GREENLING	Kelp Greenling	North	Kelp Greenling	South
KLP1	NOM. KELP ROCKFISH	Other Nearshore Rockfish	North	Shallow Nearshore Species	South
KLPR	KELP ROCKFISH	Other Nearshore Rockfish	North	Shallow Nearshore Species	South
LCD1	NOM. LINGCOD	Lingcod	North	Lingcod	South
LCOD	LINGCOD	Lingcod	North	Lingcod	South
NSHR	NORTHERN NEARSHORE ROCKFISH	Other Nearshore Rockfish	North		
NUSR	NOR. UNSP. NEARSHORE ROCKFISH	Other Nearshore Rockfish	North		
OLV1	NOM. OLIVE ROCKFISH	Other Nearshore Rockfish	North	Deeper Nearshore Species	South
OLVE	OLIVE ROCKFISH	Other Nearshore Rockfish	North	Deeper Nearshore Species	South
QLB1	NOM. QUILLBACK ROCKFISH	Other Nearshore Rockfish	North	Deeper Nearshore Species	South
QLBK	QUILLBACK ROCKFISH	Other Nearshore Rockfish	North	Deeper Nearshore Species	South
RCK2	UNSP. BOLINA RCKFSH	Other Nearshore Rockfish	North	Deeper Nearshore Species	South
RCK7	UNSP. GOPHER RCKFSH	Other Nearshore Rockfish	North	Shallow Nearshore Species	South
RCK9	BLACK+BLUE ROCKFISH	Other Nearshore Rockfish	North	Deeper Nearshore Species	South
SCOR	CALIFORNIA SCORPIONFISH			Shallow Nearshore Species	South
SCR1	NOM. CALIF. SCORPIONFISH			Shallow Nearshore Species	South
SHP1	NOM. CALIFORNIA SHEEPHEAD			California Sheephead	South
SHPD	CALIFORNIA SHEEPHEAD			California Sheephead	South
SSHR	SOUTHERN NEARSHORE ROCKFISH			Deeper Nearshore Species	South
SSRD	Deep So. Nearshore RF			Deeper Nearshore Species	South
SSRS	Shallow So. Nearshore RF			Shallow Nearshore Species	South
SUSR	SOU. UNSP. NEARSHORE ROCKFISH			Deeper Nearshore Species	South
TRE1	NOM. TREEFISH	Other Nearshore Rockfish	North	Deeper Nearshore Species	South
TREE	TREEFISH	Other Nearshore Rockfish	North	Deeper Nearshore Species	South
UDNR	UNSP. DEEP NEARSHORE RF			Deeper Nearshore Species	South
USHR	UNSP. NEARSHORE ROCKFISH			Deeper Nearshore Species	South

APPENDIX C. Port Groups

State	Port Group	Port
OR	Astoria	Astoria / Warrenton
		Pacific City
		Garibaldi (Tillamook)
	Southern Oregon	Newport
		Bandon
		Charleston (Coos Bay)
		Florence
		Winchester Bay
		Brookings
		Gold Beach
		Port Orford
CA	Crescent City / Eureka	Crescent City
		Eureka
		Fields Landing
		Trinidad
	Fort Bragg	Albion
		Point Arena
		Bodega Bay
		Fort Bragg
	San Francisco / Monterey	Oakland
		Richmond
		San Francisco
		San Francisco Area
		Santa Cruz
		Monterey
		Moss Landing
		Princeton (Half Moon Bay)
	Morro Bay / Los Angeles	Avila
		Morro Bay
		San Luis Obispo Area
		San Simeon
		Ventura
		Oxnard
		Santa Barbara
		Dana Point Harbor
		Los Angeles Area
		Los Angeles
		Newport Beach
		Oceanside
		San Diego
		San Diego Area
		Marina Del Rey

Table 1. Number of vessels, trips, sets, and metric tons (mt) of retained catch observed by port group on nearshore trips from January 1, 2006 to April 30, 2007.

2006

	Vessels		Trips		Sets		Landings	
Port Group	n	% by Port Group	n	% by Port Group	n	% by Port Group	mt	% by Port Group
Astoria	11	12%	52	15%	80	15%	4.4	14%
S. Oregon	43	46%	185	55%	298	56%	16.8	55%
Crescent City/Eureka	13	14%	34	10%	39	7%	6.2	20%
Fort Bragg	5	5%	9	3%	24	5%	0.4	1%
San Francisco/Monterey	5	5%	14	4%	17	3%	1.1	4%
Morro Bay/Los Angeles	17	18%	43	13%	74	14%	1.9	6%
All Ports	94	100%	337	100%	532	100%	30.8	100%

January - April 2007

	Vessels		Trips		Sets		Landings	
Port Group	n	% by Port Group	n	% by Port Group	n	% by Port Group	mt	% by Port Group
Oregon	10	59%	20	34%	23	28%	1.7	29%
Crescent City/Eureka	4	24%	26	45%	28	35%	3.3	56%
SF/Monterey/Morro Bay/LA	3	18%	12	21%	30	37%	0.8	14%
All Ports	17	100%	58	100%	81	100%	5.9	100%

Table 2. Weights for selected species/species groups from observed sets and fish tickets from the nearshore, fixed-gear fishery by area from January 1, 2006 to April 30, 2007.

YEAR 2006

Area	Species	Observed Retained Catch (lbs)	Fishticket Landings (lbs)	Observed lbs as a % of fishticket lbs
NORTH	Nearshore Rockfish	42,045	401,880	10.5%
	Cabezon	6,547	54,313	12.1%
	Kelp Greenling	4,290	32,492	13.2%
	Lingcod	6,249	76,940	8.1%
SOUTH	Nearshore Rockfish	4,605	187,144	2.5%
	Cabezon	1,157	56,382	2.1%
	California Sheephead	405	84,875	0.5%
	Kelp Greenling	61	3,105	2.0%
	Lingcod	394	38,376	1.0%

JAN - APR 2007

Area	Species	Observed Retained Catch (lbs)	Fishticket Landings (lbs)	Observed lbs as a % of fishticket lbs
NORTH	Nearshore Rockfish	9,677	78,046	12.4%
	Cabezon	288	10,374	2.8%
	Kelp Greenling	573	8,260	6.9%
	Lingcod	0	316	0.0%
SOUTH	Nearshore Rockfish	1,032	24,263	4.3%
	Cabezon	112	10,937	1.0%
	California Sheephead	526	16,435	3.2%
	Kelp Greenling	8	924	0.8%

Table 3. Number of observed nearshore, fixed-gear sets by area and depth from January 1, 2006 to April 30, 2007. North is defined as north of 40° 10' N lat. and south is defined as south of 40° 10' N lat.

	Depth			
Year/Area	0-10 fm	11-20 fm	21 - 50 fm	0 - 50 fm
2006				
North	218	188	11	417
South	69	43	3	115
Coastwide	287	231	14	532
Jan - Apr 2007				
North	6	38	7	51
South	11	18	1	30
Coastwide	17	56	8	81

Table 4. Discard rates for species from observed nearshore, fixed-gear fishery sets by depth and area from January 1, 2006 to April 30, 2007. North is defined as north of 40° 10' N lat. and south is defined as south of 40° 10' N lat.

2006

	0-10 fathoms					11-20 fathoms					21 - 50 fathoms					0 - 50 fathoms				
	Discarded		Retained		Total	Discarded		Retained		Total	Discarded		Retained		Total	Discarded		Retained		Total
Area/Species	lbs	%	lb	%	lb	lbs	%	lb	%	lb	lbs	%	lb	%	lb	lbs	%	lb	%	lb
North																				
Black Rockfish	703	4%	17,873	96%	18,576	1,002	6%	14,615	94%	15,617	8	1%	950	99%	958	1,713	5%	33,438	95%	35,151
Blue Rockfish	528	28%	1,383	72%	1,911	1,035	28%	2,703	72%	3,737	130	13%	895	87%	1,024	1,692	25%	4,980	75%	6,672
Cabezon	297	14%	1,874	86%	2,171	530	10%	4,554	90%	5,084	13	10%	119	90%	132	839	11%	6,547	89%	7,387
Kelp Greenling	184	7%	2,401	93%	2,585	403	18%	1,802	82%	2,205	41	32%	87	68%	128	628	13%	4,290	87%	4,918
Lingcod	1,963	46%	2,337	54%	4,301	2,061	40%	3,151	60%	5,211	141	16%	761	84%	902	4,165	40%	6,249	60%	10,414
Other Nearshore Rockfish	52	4%	1,157	96%	1,209	61	3%	2,027	97%	2,088	15	3%	443	97%	458	129	3%	3,627	97%	3,755
South																				
Black Rockfish	40	34%	79	66%	119	71	47%	81	53%	153						111	41%	160	59%	271
Cabezon	426	31%	960	69%	1,386	84	53%	74	47%	158			123	100%	123	509	31%	1,157	69%	1,666
California Sheephead	363	47%	405	53%	768											363	47%	405	53%	768
Deeper Nearshore Species	213	12%	1,509	88%	1,721	197	10%	1,679	90%	1,876	5	11%	37	89%	42	414	11%	3,225	89%	3,639
Kelp Greenling	104	67%	52	33%	156	93	91%	9	9%	102	70	100%			70	267	81%	61	19%	328
Lingcod	503	69%	224	31%	727	329	67%	164	33%	493	57	92%	5	8%	62	889	69%	394	31%	1,283
Shallow Nearshore Species	122	11%	966	89%	1,088	119	32%	252	68%	371			2	100%	2	241	16%	1,220	84%	1,461

Table 4 (cont.). Discard rates for species from observed nearshore fishery sets by depth and area from January 1, 2006 to April 30, 2007. North is defined as north of 40° 10' N lat. and south is defined as south of 40° 10' N lat.

Jan - Apr 2007

	0-10 fathoms					11-20 fathoms					21 - 50 fathoms					0 - 50 fathoms				
	Discarded		Retained		Total	Discarded		Retained		Total	Discarded		Retained		Total	Discarded		Retained		Total
Area/Species	lbs	%	lb	%	lb	lbs	%	lb	%	lb	lbs	%	lb	%	lb	lbs	%	lb	%	lb
North																				
Black Rockfish	24	6%	388	94%	412	76	1%	5,698	99%	5,774	2	0%	630	100%	632	102	1%	6,716	99%	6,818
Blue Rockfish	3	33%	5	67%	8	200	8%	2,186	92%	2,386	4	1%	356	99%	360	207	8%	2,547	92%	2,753
Cabezon	4	5%	80	95%	84	89	30%	208	70%	297	38	100%			38	131	31%	288	69%	419
Kelp Greenling	11	4%	248	96%	259	74	19%	325	81%	399	11	100%			11	97	14%	573	86%	669
Lingcod	288	100%			288	966	100%			966	43	100%			43	1,297	100%			1,297
Other Nearshore Rockfish	2	5%	29	95%	30	8	3%	223	97%	231	1	1%	162	99%	163	10	2%	414	98%	424
South																				
Black Rockfish	3	100%			3	14	100%			14						17	100%			17
Cabezon	63	40%	97	60%	160	54	78%	15	22%	70						118	51%	112	49%	230
California Sheephead	75	15%	407	85%	482	42	26%	119	74%	161						117	18%	526	82%	643
Deeper Nearshore Species	73	46%	87	54%	160	84	11%	700	89%	784	12	100%			12	170	18%	787	82%	956
Kelp Greenling			4	100%	4	8	71%	4	29%	12						8	52%	8	48%	16
Lingcod	184	100%			184	198	100%			198						383	100%			383
Shallow Nearshore Species	35	15%	193	85%	228	13	19%	52	81%	65						48	16%	245	84%	293

Table 5. Discard rates for rebuilding species from observed nearshore, fixed-gear fishery sets by depth and area from January 1, 2006 to April 30, 2007. North is defined as north of 40° 10' N lat. and south is defined as south of 40° 10' N lat.

2006

	0-10 fathoms					11-20 fathoms					21 - 50 fathoms					0 - 50 fathoms				
	Discarded		Retained		Total	Discarded		Retained		Total	Discarded		Retained		Total	Discarded		Retained		Total
Area/Species	lbs	%	lb	%	lb	lbs	%	lb	%	lb	lbs	%	lb	%	lb	lbs	%	lb	%	lb
North																				
Bocaccio Rockfish																				
Canary Rockfish	132	100%			132	348	100%			348	76	100%			76	556	100%			556
Cowcod Rockfish																				
Darkblotched Rockfish																				
Pacific Ocean Perch																				
Widow Rockfish						12	53%	11	47%	23	5	77%	2	23%	7	17	59%	12	41%	30
Yelloweye Rockfish	59	100%			59	166	99%	2	1%	166	115	100%			115	340	99%	2	1%	342
South																				
Bocaccio Rockfish								1	100%	1			2	100%	2			3	100%	3
Canary Rockfish	9	100%			9	150	100%			150	1	100%			1	160	100%			160
Cowcod Rockfish																				
Darkblotched Rockfish																				
Pacific Ocean Perch																				
Widow Rockfish																				
Yelloweye Rockfish																				

Table 5 (cont.). Discard rates for rebuilding species from observed nearshore, fixed-gear fishery sets by depth and area from January 1, 2006 to April 30, 2007. North is defined as north of 40° 10' N lat. and south is defined as south of 40° 10' N lat.

Jan - Apr 2007

	0-10 fathoms					11-20 fathoms					21 - 50 fathoms					0 - 50 fathoms				
	Discarded		Retained		Total	Discarded		Retained		Total	Discarded		Retained		Total	Discarded		Retained		Total
Area/Species	lbs	%	lb	%	lb	lbs	%	lb	%	lb	lbs	%	lb	%	lb	lbs	%	lb	%	lb
North																				
Bocaccio Rockfish								3	100%	3								3	100%	3
Canary Rockfish						198	100%			198	31	100%			31	229	100%			229
Cowcod Rockfish																				
Darkblotched Rockfish																				
Pacific Ocean Perch																				
Widow Rockfish						34	34%	68	66%	102	5	77%	2	23%	7	39	36%	69	64%	108
Yelloweye Rockfish						21	100%			21	67	100%			67	88	100%			88
South																				
Bocaccio Rockfish																				
Canary Rockfish						16	100%			16						16	100%			16
Cowcod Rockfish																				
Darkblotched Rockfish																				
Pacific Ocean Perch																				
Widow Rockfish																				
Yelloweye Rockfish																				

Table 6. Ratio estimate and standard errors for the total bycatch of seven rebuilding species per 100 pounds of nearshore fish by area, depth and year from January 1, 2006 to April 30, 2007 on observed nearshore, fixed-gear sets. North is defined as north of 40° 10' N lat. and south is defined as south of 40° 10' N lat. Standard errors cannot be calculated when there is only one set in a category.

2006

	0 - 10 fm			11 - 20 fm			21 - 50 fm		
	Number	per 100 lb of retained nearshore		Number	per 100 lb of retained nearshore		Number	per 100 lb of retained nearshore	
Area/Species	of sets	ratio	se	of sets	ratio	se	of sets	ratio	se
North									
Bocaccio Rockfish	218	0		188	0		11	0	
Canary Rockfish	218	0.4886	0.1203	188	1.2067	0.2341	11	2.3227	1.0192
Cowcod Rockfish	218	0		188	0		11	0	
Darkblotched Rockfish	218	0		188	0		11	0	
Pacific Ocean Perch	218	0		188	0		11	0	
Widow Rockfish	218	0		188	0.0801	0.0412	11	0.1997	0.1483
Yelloweye Rockfish	218	0.2185	0.1507	188	0.5830	0.2216	11	3.5255	1.1259
South									
Bocaccio Rockfish	69	0		43	0.0442	0.0435	3	8.9242	12.4048
Canary Rockfish	69	0.2145	0.1892	43	6.6552	3.3969	3	0.2997	0.3956
Cowcod Rockfish	69	0		43	0		3	0	
Darkblotched Rockfish	69	0		43	0		3	0	
Pacific Ocean Perch	69	0		43	0		3	0	
Widow Rockfish	69	0		43	0		3	0	
Yelloweye Rockfish	69	0		43	0		3	0	

Jan - Apr 2007

	0 - 10 fm			11 - 20 fm			21 - 50 fm		
	Number	per 100 lb of retained nearshore		Number	per 100 lb of retained nearshore		Number	per 100 lb of retained nearshore	
Area/Species	of sets	ratio	se	of sets	ratio	se	of sets	ratio	se
North									
Bocaccio Rockfish	6	0		38	0.0347	0.0349	7	0	
Canary Rockfish	6	0		38	2.2913	0.9321	7	2.6616	1.4505
Cowcod Rockfish	6	0		38	0		7	0	
Darkblotched Rockfish	6	0		38	0		7	0	
Pacific Ocean Perch	6	0		38	0		7	0	
Widow Rockfish	6	0		38	1.1784	0.4942	7	0.5750	0.3434
Yelloweye Rockfish	6	0		38	0.2431	0.1134	7	5.8721	3.9364
South									
Bocaccio Rockfish	11	0		18	0		1[a]		
Canary Rockfish	11	0		18	1.8438	1.0091	1[a]		
Cowcod Rockfish	11	0		18	0		1[a]		
Darkblotched Rockfish	11	0		18	0		1[a]		
Pacific Ocean Perch	11	0		18	0		1[a]		
Widow Rockfish	11	0		18	0		1[a]		
Yelloweye Rockfish	11	0		18	0		1[a]		

[a] Bycatch rates cannot be estimated because there were no nearshore species in the retained catch.