

Enhanced Sampling of the Washington Coast Recreational Groundfish Fishery 2014-2017

by Robert Davis and
Lorna Wargo



*Washington Department of
FISH AND WILDLIFE
Fish Program
Fish Management Division*

Enhanced Sampling of the Washington Coast Recreational Groundfish Fishery 2014-2017

Technical Report No. FPT 20-05

Robert Davis and Lorna Wargo

Washington Department of Fish and Wildlife
Fish Program
Marine Resources Division
PO Box 43150
Olympia, Washington 98504-3150

March 2020

Acknowledgements

Sampling recreationally caught groundfish (or bottomfish) is a physically strenuous, fast-paced and technically demanding endeavor, especially at Westport. We extend our deep appreciation to all the Washington Department of Fish and Wildlife staff that have served on the “barge.” In particular, we would like to recognize Michael Sinclair, Kristen Hinton, Jennifer Simpson, Hanna Grout and Charlie Blake for their dedication to collecting biological data that underpins the science and management of coastal groundfish fisheries. We also extend our appreciation to the many Westport charter vessel operators that have voluntarily delivered fish carcasses over the years for sampling.

Abstract

The Washington Department of Fish and Wildlife (WDFW) supports groundfish stock assessment and management of fisheries through several interrelated groups that collect and process biological and catch data. The coastal section of the WDFW Marine Fish Science (MFS) group conducts coastwide commercial fishery sampling, research including fishery independent at-sea surveys and supplementary recreational fishery sampling at three major coastal ports: Westport, La Push and Neah Bay. From 2014 to 2017, the coastal MFS recreational groundfish sampling program (RGSP) had two major objectives. The primary objective was to scan recreational groundfish catch to recover tag information and biological data from fish tagged and released during at-sea surveys. In addition to tag recovery operations, the RGSP directly supported research and stock assessment by collecting biological data from untagged recreationally caught groundfish species. This biological information enhances data collection efforts of the WDFW Ocean Sampling Program which is tasked primarily with generating catch estimates for all recreationally targeted species, e.g., salmon and groundfish, for the Washington coast. This report provides a characterization of Washington's coastal groundfish recreational fishery and summarizes the RGSP sampling operations from 2014 through 2017 including data collected, sampling methods and ongoing procedural development.

Table of Contents

Acknowledgements.....	i
Abstract.....	ii
Table of Contents.....	iii
List of Tables.....	iv
List of Figures.....	v
Introduction.....	1
Fishery Description.....	2
Regulations.....	3
Description of Washington’s Coastal Recreational Ports.....	3
Recreational Groundfish Fishery Monitoring.....	5
History of the WDFW Nearshore Groundfish Survey Relating to MFS Dockside Operations.....	5
Methods.....	7
Biological Sampling.....	8
Tag Detection.....	9
Data Collection Digitization.....	10
Results.....	12
Further Study.....	14
References.....	15
Tables.....	16
Figures.....	21
Appendices.....	26
Appendix A. Evaluation of the Recreational Groundfish Sampling Program’s Dockside Sampling Strategy of the Westport Charter Groundfish Fishery.....	26

List of Tables

Table 1.	Nearshore groundfish catch regulations, 2014 to 2016. Marine Area 4 is split: west (4a) and east (4b) of the Bonilla-Tatoosh line	16
Table 2.	Groundfish catch regulations in place for 2017.....	16
Table 3.	Number of recreationally targeted groundfish species (number of individuals) landed at primary Washington ports from 2014-2017	17
Table 4.	Washington Coast landings of recreationally targeted groundfish species by number of individuals from 2014-2017	17
Table 5.	Total number of fish released with internal tags in the nearshore groundfish survey from 1998 to 2017 by Marine Area and tag type.....	18
Table 6.	Annual Washington coast minimum biological data collection goals from recreational catch for 2014 to 2016	18
Table 7.	2017 Washington coast minimum biological data collection goals from recreational catch.....	18
Table 8.	Number of days spent sampling at each port by RGSP dockside samplers, 2014 to 2017	18
Table 9.	Total age structures collected by RGSP dockside staff from 2014 to 2017	19
Table 10.	Number of fish by species scanned for internal tags on the Washington coast from 2014 to 2017	19
Table 11.	Number of tagged fish recovered from RGSP dockside sampling from 2014 to 2017	20

List of Figures

Figure 1.	Major recreational coastal ports of Washington and associated Marine Areas.....	21
Figure 2.	Number of recreational angler trips targeting groundfish by port of landing from 2014 to 2017	22
Figure 3.	Total number of tagged fish released by Marine Area from 1998 to 2017 on the MFS nearshore survey	22
Figure 4.	Tag detection equipment used by RGSP dockside samplers.....	23
Figure 5.	Lingcod fin ray collection diagram.....	23
Figure 6.	Number of individual groundfish weights collected by RGSP dockside samplers from 2014 to 2017	24
Figure 7.	Number of age structures collected by the RGSP from 2014 through 2017	24
Figure 8.	Estimated percentage of total recreational groundfish landings scanned for internal tags.....	25

Introduction

The recreational marine finfish fishery along the Washington coast is an important component of the Washington economy that, as of 2014, was estimated to be worth \$32.1 million in trip-related expenditures, and supported 325 jobs and \$17.3 million in labor income within the coastal economy (Taylor et al, 2015). Major recreational fishing opportunities for saltwater anglers on the Washington coast can be categorized into four different targeted species groups including salmon, groundfish (or bottomfish), Pacific Halibut, and Albacore Tuna. Of these, fishing for groundfish is markedly popular, and accounts for the second most numerous recreational angler trips on the Washington coast following salmon.

Nearshore groundfish species (or bottomfish), especially Black Rockfish, are valuable to Washington's charter fishing industry as rockfish have high site fidelity (Parker et al, 2007) facilitating their capture trip after trip. In addition, the abundance of Black Rockfish in Washington's coastal waters has been the main contributor to a significant catch rate of approximately eight groundfish per angler trip (i.e., per bottomfish trip type) on the Washington coast in 2014. Other groundfish species typically targeted by recreational anglers include Cabezon, Kelp Greenling, Lingcod, and all nearshore inhabiting rockfish species.

The Pacific Fishery Management Council, who oversee the management of U.S. West Coast groundfish, includes over 100 different rockfish, flatfish, roundfish, sharks, skates, and other fish species that live on or near the bottom of the ocean in their groundfish fishery management plan (PFMC 2019). For the purposes of this report, the term groundfish is used specifically to refer to groundfish species that are typically targeted by coastal recreational anglers including rockfish, Cabezon, Kelp Greenling, and Lingcod. These species are included in Washington regulations and management under the term "bottomfish." Pacific Halibut, salmon, and tuna are not included in either category.

Fishery dependent information on the recreational groundfish fishery, used by resource managers to monitor population size and exploitation rates of these valuable species, is collected through two separate work units within the Washington Department of Fish and Wildlife (WDFW). The Ocean Sampling Program (OSP) generates recreational catch estimates for all targeted species (including groundfish) for the entire Washington coast. Also covering the entire coast, the Recreational Groundfish Sampling Program (RGSP) conducts dockside sampling that supports both fishery dependent and independent monitoring. The RGSP is housed within the Marine Fish Science (MFS) unit of the WDFW's Fish Program, Fish Management Division.

The primary objective (through 2017) of the RGSP is to complement WDFW at-sea tagging research surveys by scanning recreational groundfish catch for tagged fish, and to retrieve tag and biological data from the recaptured fish. In addition to tag recovery operations, the RGSP informs stock assessments through the collection of biological data from recreationally caught nearshore groundfish species. This report provides a characterization of Washington’s coastal groundfish recreational fishery – describing the fishery, regulations, and key fishing ports; and, briefly summarizes relevant program history, and details the RGSP sampling operations from 2014 through 2017 including data collected, sampling methods, and ongoing procedural development. An ancillary project conducted in 2017 to evaluate for potential bias in RGSP sampling is summarized in Appendix A.

Fishery Description

Nearshore groundfish off the Washington coast are harvested almost exclusively by recreational anglers. This is due to management regulations put in place in the late 1990’s prohibiting most commercial fishing gear types that would encounter groundfish within Washington’s state territorial waters, which extend 3 miles offshore (Figure 1). The nearshore prohibition of commercial fishing gear types includes setline, bottomfish pots, jig, bottomfish troll and trawl gear (WAC 220-355-090, 2017). Washington’s complete closure of commercial groundfish fisheries within state waters is unique on the West Coast and reflects the specific intent to enhance recreational fishing opportunities and prevent local depletion of groundfish species (Cope et al, 2016).

Recreationally targeted groundfish on the Washington coast are commonly referred to as bottomfish by anglers since most species are benthic oriented and fishing methods targeting these species involve jigging artificial lures or baited hooks in an up-and-down motion on or near submersed rocky structures. While this is typical, some species will move up and down in the water column in large schools and are seen occasionally finning at the surface of the water where they can be targeted with fishing lures in the water column.

Groundfish are pursued by recreational saltwater anglers fishing from land, and both charter and private fishing vessels. While anglers do catch groundfish from jetties and docks on the coast, most groundfish are landed from vessels. Land based effort on the Washington coast, which occurs mostly on the Columbia River Jetty, accounts for only 3% of all angler trips targeting groundfish (Figure 2). Recreational fishing vessels targeting groundfish typically embark on single day trips and may target multiple species groups in a single trip depending on fishery seasons and area closures. These combination or “combo” trips pair groundfish with either salmon or halibut. These combo trips are popular among anglers, allowing them to diversify and

supplement low bag limits or catches of salmon or halibut with groundfish. While there are slightly more private vessel angler trips targeting groundfish on the Washington coast per year, overall charter vessels catch more groundfish due to their vessel size and expertise. Private vessels typically carry 1 to 6 anglers while charter vessels vary from smaller “six packs” which can carry six customers and a skipper to larger vessels that carry upwards of 30 customers, a skipper, and up to two deckhands.

Regulations

The Washington outer coast is divided into four management areas (i.e., Marine Areas or MA); numbered 1 through 4, south to north respectively, from the Washington – Oregon border to the US/Canada border (Figure 1). Regulations of nearshore groundfish along the Washington coast can vary by Marine Area (MA) and by year (current regulations can be found on the WDFW website at <https://wdfw.wa.gov/fishing/regulations>). During this reporting period, a significant amendment to regulations in 2017 adjusted seasons, daily total groundfish catch limits, and limits by species, and minimum size limits (Table 1 and 2). Notably, with the reclassification of Canary Rockfish as rebuilt in 2016 (Thorson 2016), the retention of one Canary Rockfish per day was allowed in MA’s 1 and 2 in 2017, effectively removing it from the prohibited species list.

Prior to 2017, the recreational nearshore groundfish fishery was open year round on the coast for groundfish with the exception of Lingcod. The recreational Lingcod season in MA’s 1-3 was open from the second Saturday in March through the third Saturday in October, while the Lingcod season in MA 4 typically began mid-April and ended the third Saturday in October. Seasons coastwide were changed in 2017 with the adoption of a new groundfish “winter” seasonal closure that aligned with the traditional MA 1-3 Lingcod closure. The same seasonal closure for all non-Lingcod groundfish was established for MA 4 west of the Bonilla-Tatoosh line while leaving MA 4 east of the line open year-round. All Lingcod seasons remained the same.

Description of Washington’s Coastal Recreational Ports

Multiple harbors along the Washington outer coast host the recreational fishing fleet with moorage and launching facilities. These major ports include Ilwaco, Chinook, Westport, Neah Bay and La Push (Figure 1). The port descriptions below span 2014 through 2017 and are reported from landing and effort estimates generated by the WDFW OSP. Figure 2, and Tables 3 and 4 summarize OSP data on recreational fishing activity at these main recreational ports. Landing estimates are in numbers of individual fish and effort is described by individual angler trips. Apart from the Westport charter fleet, which fillets its anglers’ catch before returning to

port and thus lands processed fish (i.e., fillet separate from carcass), groundfish are typically landed whole.

Chinook and Ilwaco are located at the mouth of the Columbia River and are characterized as having relatively low recreational groundfish effort originating from them. Vessels at these ports typically land fish caught in MA 1 and in Oregon state waters. There are no charter vessels based at Chinook, and private vessel trips from this port made up less than one percent of all Washington coast groundfish trips. Ilwaco hosts 18 charter vessels that together made 60 percent of the 10,283 groundfish trips originating there from 2014 to 2017. Over this time span, Ilwaco and Chinook typically accounted for less than six percent of all recreational groundfish landed on the Washington coast. The RGSP does not sample at Chinook or Ilwaco due to the low groundfish fishing effort, catch rates, and minimal rockfish habitat associated with these ports. However, the OSP does collect limited biological data (lengths only) from groundfish at both of these ports.

Westport, located at the entrance of Grays Harbor, is the largest coastal port in terms of recreational groundfish fishing effort and overall groundfish catch. Anglers out of Westport generally fish MA 2 and catch over half of all groundfish landed in Washington. The magnitude of this catch is largely due to the Westport charter fleet, which consisted of 32 vessels during this reporting period. Charter vessels made 84 percent of the 70,591 groundfish trips out of Westport from 2014 to 2017. Species diversity of the catch from these trips is extremely low. Black Rockfish, Yellowtail Rockfish, and Lingcod comprise 98% of all recreationally targeted groundfish landings in Westport.

La Push and Neah Bay are located on the northern Washington coast on tribal lands of the Quileute and Makah Tribes, respectively. Anglers originating their trips from La Push typically fish MA 3; while anglers originating from Neah Bay will commonly fish both the outside waters of MA 4 – the Pacific Ocean proper – and the waters east of the Bonilla-Tatoosh Line in MA 4 (commonly referred to as “4B”). The recreational fishing fleet in La Push and Neah Bay is dominated by private vessels, which accounted for 92 percent of all groundfish trips from these ports from 2014 to 2017. Seven charter vessels call La Push home and 12 are located at Neah Bay. Vessels based at La Push and Neah Bay made 14,478 and 46,028 groundfish trips respectively from 2014 to 2017. Landings from these trips accounted for 35 percent of all Washington coastal groundfish landings and comprised the most diverse assemblage of species on the coast. Neah Bay, in particular, sees a high species diversity of recreationally targeted groundfish with more “minor” groundfish species landed there than in any other Washington port. As used in this report, the term “minor” is specific to MFS research and monitoring programs and is applied to those groundfish species that are less commonly caught by recreational anglers. These minor groundfish species include Blue/Deacon Rockfish, Cabezon,

China Rockfish, Copper Rockfish, Kelp Greenling, Quillback Rockfish, Tiger Rockfish and Vermilion Rockfish.

Recreational Groundfish Fishery Monitoring

Washington's recreational groundfish fishery is monitored by the WDFW through landings estimates and biological data collected at Washington's coastal ports. The OSP produces catch estimates, expressed as numbers of fish, for all recreationally caught species on the Washington coast. However, unlike salmon fishery management that utilizes numbers of fish, groundfish assessment and management utilize estimates expressed as the weight of fish landed or the biomass, commonly expressed in metric tons. Biological data – length and weight – are used to convert catch estimates in numbers of groundfish to tonnages.

Dockside OSP samplers conduct exit and entrance counts of vessels leaving and returning to port. The OSP interviews anglers at the conclusion of their fishing trip to determine number of anglers per trip, catch numbers per angler and catch composition. This angler effort and catch data is then used to calculate estimates of total fish landings by numbers of fish. The RGSP collects the length data used to calculate estimates of landed groundfish biomass and other biological information including sex, weight and age structures for age-structured stock assessment models used in the management of nearshore groundfish species. The OSP also samples and contributes some length data from groundfish.

The collection of this fishery dependent data by both the OSP and RGSP is fed into the Recreational Fisheries Information Network (RecFIN). RecFIN is a database maintained by the Pacific States Marine Fisheries Commission (PSFMC) that houses marine recreational fisheries data collected coastwide by both state and federal agencies. This data is available to management teams and research scientists who manage these valuable marine resources.

History of the WDFW Nearshore Groundfish Survey Relating to RGSP Dockside Operations

Black Rockfish is the predominant specie making up 75 percent of all recreationally landed groundfish by number of fish. Due to the importance of this specie as a natural resource, WDFW developed and executed nearshore Black Rockfish surveys starting in 1981. Initially the purpose of these surveys was to describe the population in terms of size, distribution, and life

history. Through time these surveys have evolved to more broadly investigate all recreationally targeted groundfish species.

Tagging operations were conducted in MA 2 exclusively until 2010 when survey distribution was expanded to include all MAs off the Washington coast. However, the bulk of tags released after the expansion were still in MA 2 (Figure 3). Over the course of the surveys, Black Rockfish were tagged with various combinations of Coded Wire Tag (CWT) and Passive Integrated Transponder (PIT) tags through 2013. Wallace et al (2010) summarized in detail WDFW Black Rockfish survey operations, including tagging methods from 1981 to 2008; totals of all internal tags released in the WDFW nearshore surveys up to 2017 are summarized in Table 5. After 2013, the sampling design shifted from a mark (tag) and recapture estimation of abundance to a catch per unit of effort (CPUE) focused design and tagging of Black Rockfish was discontinued. Additionally, all other nearshore groundfish species were tagged intermittently from 2010 to 2017 as the species focus of the survey broadened.

Both tag types, CWT and PIT, used on the surveys are internal and require specialized equipment to detect their presence. Accordingly, a dockside tag recovery program was established by MFS in 1998. Dockside operations were initially based at Westport due to its proximity to Marine Area 2 where, over most years, the majority of tags were deployed, and the substantial landings of Black Rockfish by the Westport charter fleet offered a cost-effective opportunity to scan large numbers of Black Rockfish. With the expansion of tagging operations coastwide in 2010 and the shift of survey focus from just Black Rockfish to all recreationally targeted groundfish species, dockside sampling was extended to both Neah Bay and La Push in 2014 where groundfish landings are much more diverse.

Methods

The RGSP's sampling effort is temporally distributed to maximize the amount of groundfish a sampler will encounter each sampling day. Operations begin in March or April and end in September each year aligning with the bulk of the recreational groundfish effort. Sampling effort is concentrated on weekends and typically included Friday's and Monday's, when logistically feasible, and during afternoon hours when most recreational fishing vessels return. Three to four full time technicians are employed to collect data along the coast during the sampling season and are supervised by a biologist who compiles, error checks, and reports all finalized data.

Dockside operations at Westport rely heavily on cooperation between the charter vessel fleet and RGSP or other MFS staff. At the end of the fishing day, charter vessels deliver filleted carcasses to staff at the dock before returning to their slip. While it is required for vessels to land their catch for enforcement purposes (to verify fish species and bag limits), the delivery of groundfish carcasses to MFS staff is voluntary. Carcasses are processed by two technicians on a custom-built barge and are then motored outside of the boat basin to be discarded. During the sampling season, the barge is staffed four days a week and requires at least two full time staff. Due to time and staffing constraints, RGSP effort focuses on the charter fleet, which can be intercepted at a single location and typically contributes over 88% of the recreational groundfish landings in Westport. The barge is moored in proximity to the charter fleet and since most private vessels launch or moor elsewhere in the port, few bring groundfish to the barge. Thus, most private vessel catch is not sampled by RGSP staff, although OSP samplers do collect some groundfish length data from these landings. Since the sample population available to the Westport RGSP staff is restricted to voluntary deliveries by the Westport charter fleet, concerns over possible biases between delivered and undelivered catch have been raised. A study conducted in 2017 examined possible biases with this sampling design and is described in Appendix A.

Dockside sampling at La Push and Neah Bay primarily assesses smaller private vessels which predominate at these ports and is on a much smaller scale than Westport with its significant charter fleet and substantial number of private vessels. Samplers approach both private and charter vessels/anglers opportunistically as they dock or at fillet stations, sampling as many vessels as time allows in an attempt to maximize the amount of groundfish catch encountered. In 2014 and 2015, each port was covered five days a week by a single sampler throughout most of the sampling season, with additional samplers stationed in each port on days surrounding the Pacific Halibut fishery openers when recreational effort swells. With a reduction in workload in 2016 (see Tag Detection methods below), only one technician covered sampling at both La Push and Neah Bay starting in 2016. The technician's time was divided between the two ports with

priority given to sampling the high species diversity at Neah Bay; one randomly chosen weekend a month was spent in La Push over the 2016 and 2017 sampling seasons.

In order to maximize efficiency and optimize sampling, some OSP samplers assist the RGSP in collecting biological information from the diverse and less common groundfish species landed in Neah Bay. Most of this assistance occurs during the ‘shoulder’ months (March, April and October) of the groundfish season when both the RGSP and the OSP duties (e.g., angler interviews) can be conducted by a single OSP sampler. Lower fishing effort during the shoulder months affords OSP samplers time to collect the full complement of biological data, i.e., lengths and otoliths from groundfish. Otherwise, due to time constraints during the remaining months, OSP samplers typically collect only length data.

Biological Sampling

WDFW MFS research scientists set annual coastwide biological sampling goals for recreationally caught groundfish according to length and age structure population analysis needs (Table 6 and 7). Biological data collection goals for the most commonly encountered species are evenly divided into monthly goals over the sampling year, while groundfish species landed less commonly are usually sampled at as high a rate as possible. Technicians randomly collect samples from encountered groundfish species according to these objectives.

Biological information from groundfish species landed commonly and in large numbers is collected randomly at each port staffed by the RGSP. Black Rockfish, Lingcod, Yellowtail Rockfish, and Widow Rockfish are subsampled from the delivered catch at Westport. In contrast, only Black Rockfish and Lingcod are landed in high enough numbers at Neah Bay and La Push to allow for random subsampling. Biological information is taken from all other less commonly encountered groundfish species when logistically feasible.

Comprehensive biological information includes fork length in centimeters, weight in grams, sex information, and age structure collection (otolith or Lingcod dorsal fin ray). When possible, both sagittal otoliths from each fish are extracted, cleaned, and dried in the field, then stored in 100 compartment Tray Bien trays for later processing and ageing. Lingcod fin rays collected are the numbers four through eight soft dorsal rays of the posterior (second) dorsal fin (Figure 5). Fin rays are stored in envelopes while in the field, then frozen for later processing and reading by WDFW staff. All biological information is recorded separately by species, date (typically to the month), boat type (charter or private), and port. In addition, all biological information collected from groundfish landed by the Westport charter fleet in 2017 was recorded by individual vessel.

Tag Detection

When scanning recreationally landed groundfish for tags, each fish is scanned and tallied by specie, date, and port of landing. The placement of inserted tags either in the medial-ventral pectoral tissue or cheek allow tags to be recovered from whole fish or filleted carcasses. With various tag types used (Table 5) on a variety of species over the course of the WDFW nearshore groundfish studies, dockside tag detection, and processing has to be robust to capture information from the different tag types deployed.

Tag detection equipment (Figure 4) required is particular to the type of tag (CWT or PIT) used. CWT tags can be detected with either an R-series tunnel detector (R8000) or with a handheld wand; both are produced by Northwest Marine Technology, Inc. The R8000 is a large, 64-pound detector that has a tunnel in which multiple fish can be passed through. The R8000 is capable of scanning many fish quickly and accurately but is not very mobile. The hand held wand is passed over individual fish to detect a tag, which is slower but much more portable. In addition, the hand held wand is capable of detecting, but not reading PIT tags, making it the most versatile piece of tag detection equipment. PIT tags are detected and read with either a Portable Transceiver System, PTS Model FS2001F-ISO (Destron), or with a Biomark 601 Handheld reader (601 reader) produced by Biomark. Destrons can be used with various antenna designs including a portable, tabletop version and a 24-inch square pass-through antenna. The Destrons are typically used in a constant scan mode so that fish can be quickly passed through, or by, an antenna for tag detection. The 601 readers are less versatile and functional when scanning many fish, but are much more portable than the Destrons.

All recaptured fish are checked with either a 601 reader or Destron to confirm the presence of PIT tags and obtain the PIT tag number. For fish that are found to have a CWT but no PIT tag, the head of the fish is collected, labeled, and frozen for later CWT extraction in the lab to determine tag number. The length, sex, and tag number of all tagged fish are recorded, and their otoliths are collected for ageing. The type of tag recovered, and the type of detection equipment used is also noted.

All Black Rockfish, Yellowtail Rockfish, Widow Rockfish and Lingcod delivered to the RGSP samplers at Westport are checked for tags with a R8000 CWT detector. These species, if tagged, typically have at least one CWT and the sampling station at this port allows for a detector of this size, permitting samplers to scan the majority of groundfish delivered quickly. As a secondary measure, all groundfish are passed through a 24-inch square pass-through Destron antenna to check for the presence of any PIT tags that may have been missed by the R8000 due to a CWT loss. To efficiently process thousands of carcasses daily, fish are dumped 15 to 20 at a time

through this pass-through antenna and into large bins for disposal. Because of this operational necessity, occasionally a PIT tagged fish is detected by the Destron pass-through antenna, but the sampler is unable to find the tagged fish amongst all of the carcasses. While the PIT tag number is captured and noted for these fish, the sampler cannot confirm the presence/absence of a CWT and the tag type is noted as unknown. Due to interference with other electronic devices on the barge and in the port, this antenna is unreliable and only used in a secondary capacity. All other groundfish species delivered to RGSP samplers are caught in relatively low numbers and are typically not tagged with CWTs. These other species are scanned individually with a handheld wand.

At La Push and Neah Bay, all sampled groundfish were scanned with a handheld CWT wand in 2014 and 2015. Some private anglers at these ports have a tendency to bleed their fish by slitting through the throat patch into the heart cavity. Since this type of cut is through the flesh where PIT tags are inserted, this bleed-type was noted since tags could have been inadvertently removed. Due to low tag recoveries in these ports (historically fewer fish were tagged in MAs 3 and 4), scanning for tags was halted in 2016 and samplers only collected biological information.

Data Collection Digitization

Starting in 2014, the RGSP group began to digitize dockside data collection to reduce data entry errors, and the time and effort required to enter large amounts of raw data. Digital data collection testing was initiated in Westport because the barge and its sample station infrastructure made it easy to set up electronics in a testing environment. Initially, Microsoft Access data entry forms were developed to enter and compile scanned fish tallies in the field as carcasses were being processed. Weather resistant, durable, and portable, Panasonic Toughpads were used for computing. All scan count data at Westport was recorded on these devices from 2014-2016. In 2015, digital data collection expanded to include all tag recovery biological information with the exception of PIT tag numbers. PIT tag numbers were read and saved in the field on a Destron, then downloaded and appended into the master scan database at the conclusion of the sampling day. All Access data were saved in daily files and error checked. Once edited, the daily files were appended individually to the master Access database.

By the end of 2016, iForms entry forms were developed to collect biological information at Westport. These electronic forms were created through a web-based product called iFormBuilder designed by Zerion. Through iFormBuilder, mobile electronic forms can be developed and maintained for data collection in the field through the mobile application called iForms. Data collected with iForms can be stored, edited, and exported to other spreadsheet programs through iFormBuilder. Forms created for the iForms application are less versatile than

Access forms but are much more user friendly and easier to develop. iPads, with Lifeproof, cases were used with iForms, which have performed in the field as well as the Toughpads. With the addition of the biological information iForm, all data collected at the Westport docks were digitally collected by the end of 2016.

In 2017, scan and tag recovery data collection was migrated from Access to iForms to reduce the need for multiple tablet devices in the field. In addition, an application developed by WDFW information technology staff allowed for the direct import of PIT tag numbers into iForms, removing the need for a secondary data transfer of recovery tag numbers at the end of the sampling day.

Due to the mobile nature of the workflow in La Push and Neah Bay – samplers move from vessel to vessel at the dock as anglers return to port – it is challenging to develop digital collection tools and their progress took more time. Prior to 2017, all data collected in La Push and Neah Bay was handwritten in the field, then entered into an Access database and error checked at the office. In 2017, iForms were developed and implemented for the collection of biological information by RGSP samplers out of these ports. Biological data collected by OSP samplers for the RGSP remained on paper forms for this time period.

The supervising biologist compiled, error checked, and entered or appended all data, digital or otherwise, into master Access databases. Scan tallies and tag information are housed in a database that includes all MFS tag recovery information and biological data are entered into a database termed the Biological Data System (BDS). The BDS is maintained by WDFW and houses all non-salmon marine fish biological information collected in Washington. Recreational data in the BDS was sent to PSMFC annually for entry into RecFIN until June of 2017, when the frequency of uploads increased to monthly.

Results

Dockside sampling effort is shown in Table 8 (number of days per year by port) with each sampling day representing at least two samplers at Westport and at least one at La Push and Neah Bay. Biological information collected at these ports included sex, length, and age structures for all groundfish selected for biological sampling. Due to time constraints and few encounters with un-filleted fish from the Westport charter fleet, limited individual fish weights were collected in 2014 and 2015. However, with the reduction in workload at the northern ports due to the elimination of tag-scanning procedures, weight collections increased substantially at Neah Bay and La Push in 2016 and 2017 (Figure 6).

The largest constraint influencing biological data collection was the quantity and diversity of landings at each port and subsequent pool of fish from which to sample. Black Rockfish and Lingcod are commonly landed in sufficient numbers such that coastwide biological sampling goals were attained and collections were spread across the major ports (Figure 7). In contrast and consistent with landing patterns, Yellowtail, Widow, Canary and Quillback rockfish were predominantly collected at Westport, and most samples of all other minor groundfish species were collected at the north ports, particularly Neah Bay. Yellowtail Rockfish, and to a lesser extent Widow Rockfish, were encountered regularly enough at Westport that sampling goals were typically attained (Table 9). Landings of all other groundfish species at all other ports were so small that goal minimums were unattainable even when every individual encountered was sampled.

Similar to biological data collections, the total number and diversity of groundfish scanned each year paralleled landings estimates at each port (Table 10). Notably, total scanned groundfish dropped from 140,106 in 2016 to 97,116 in 2017, while scanned Canary Rockfish increased from 0 to 1751 during the same period, correlating with regulatory changes (Table 1 and Table 2) and associated landings. Black Rockfish was the most encountered and scanned groundfish in all three ports every year scanning occurred. Staff at Westport alone scanned 346,553 Black Rockfish, comprising over half of all groundfish scanned coastwide from 2014 to 2017. Westport samplers also encountered the most Lingcod, Yellowtail Rockfish, and Widow Rockfish each year coastwide scanning took place. Landed minor groundfish species were much more prevalent in La Push and Neah Bay, and the species composition of scanned fish mirrored that distribution. Over the four-year period, samplers scanned 52 percent of recreationally landed groundfish in Westport. In 2014 and 2015, samplers scanned 43 and 23 percent of recreationally landed groundfish in La Push and Neah Bay, respectively (Figure 8).

Most tags were recovered at Westport. The recreational fishery at Westport lands the highest numbers of groundfish and largely fishes MA 2 where the majority of tagged groundfish have been released. For comparison, between 2014 and 2015, 712 tagged Black Rockfish were detected at Westport whereas only 36 were detected at La Push and Neah Bay combined, before scanning was stopped in the latter two ports due to the lack of recoveries (Table 11). Few minor groundfish species with tags were detected over the 2014-2017 time period; only one China Rockfish and one Copper Rockfish in Neah Bay and three Deacon Rockfish in Westport were recovered.

Further Study

With the annual nearshore groundfish survey evolving away from mark (tag) and recapture abundance estimation methods, dockside tag recoveries have begun to decline (Table 11). In 2013, the last year Black Rockfish were tagged in the survey, 720 Black Rockfish recoveries were detected in Westport corresponding to a 1.03 percent recovery rate. Four years later, in 2017, 145 Black Rockfish recoveries were detected producing a substantially lower recovery rate of 0.24 percent. With this reduction in recovery rates, the usefulness of further recapture data was minimal and recovery operations were concluded following the 2018 season.

While dockside operations as a tag recovery tool has become less valuable, the structure of the RGSP has been vital in the collection of biological data. This program is the largest source of biological information of recreationally caught groundfish on the Washington coast. This information is directly used in stock assessments that guide management decisions and is invaluable – particularly the data collected from recreationally targeted minor groundfish species. Resource scientists consistently request more data for these species to better inform stock assessments. The RSGP will continue biological data collection of recreational groundfish catch at Westport, La Push, and Neah Bay in support of these assessments.

References

- Cope, J.M., D. Sampson, A. Stephens, M. Key, P.P. Mirick, M. Stachura, T.S. Tsou, P. Weyland, A. Berger, T. Buell, E. Councill, E.J. Dick, K.H. Fenske, M. Monk, B.T. Rodomsky. 2016. *Assessments of California, Oregon and Washington Stocks of Black Rockfish (Sebastes melanops) in 2015*. Pacific Fishery Management Council. Portland, Oregon.
- PFMC (Pacific Fishery Management Council). 2019. Pacific Coast Groundfish Fishery Management Plan for the California, Oregon, and Washington Groundfish Fishery. Portland, Oregon. pp. 159.
- Parker, S.J., P. S. Rankin, J. M. Olson, R.W. Hannah. 2007. "Movement Patterns of Black Rockfish (*Sebastes melanops*) in Oregon Coastal Waters." *Biology, Assessment, and Management of North Pacific Rockfishes* (Alaska Sea Grant College Program) 39-57.
- Taylor, M.L., J.R. Baker, E.C. Waters, T.C. Wegge, K. Wellman. 2015. *Economic Analysis to Support Marine Spatial Planning in Washington*. Economic Analysis Report, Washington Coastal Marine Advisory Council, 210.
- Thorson, J.T., C. Wetzel. 2016. *The Status of Canary Rockfish (Sebastes pinniger) in the California Current in 2015*. Seattle, WA: Northwest Fisheries Science Center, U.S. Department of Commerce, National Ocean and Atmospheric Administration, National Marine Fisheries Service.
- Wallace, F.,T., Tsou, Y.W. Cheng, L. Wargo. 2010. *Summary of the Coastal Black Rockfish Tagging Program 1981-2008*. Technical Report No. FPT 11-02, State of Washington Department of Fish and Wildlife.

Tables

Table 1. Nearshore groundfish catch regulations, 2014 to 2016. Marine Area 4 is split: west (4a) and east (4b) of the Bonilla-Tatoosh line.

Marine Area	Groundfish Daily Catch Limit	Sub Bag Limit	Prohibited Species	Minium Size Limit
1	12	10 rockfish; 2 Cabezon; 2 Lingcod	Yelloweye Rockfish; Canary Rockfish	Lingcod 22"
2	12	10 rockfish; 2 Cabezon; 2 Lingcod	Yelloweye Rockfish; Canary Rockfish	Lingcod 22"
3	12	10 rockfish; 2 Cabezon; 2 Lingcod	Yelloweye Rockfish; Canary Rockfish	Lingcod 22"
4a	12	11 rockfish; 1 Cabezon; 2 Lingcod	Yelloweye Rockfish; Canary Rockfish	Lingcod 22"; Cabezon 18"
4b	10	6 rockfish; 1 Cabezon; 2 Lingcod	All rockfish except Black and Blue Rockfish	Lingcod 22"; Cabezon 18"

Table 2. Groundfish catch regulations in place for 2017. Marine Area 4 is split: west (4a) and east (4b) of the Bonilla-Tatoosh line.

Marine Area	Groundfish Daily Catch Limit	Sub Bag Limit	Prohibited Species	Minium Size Limit
1	9	7 rockfish one of which can be a Canary Rockfish; 2 Cabezon; 2 Lingcod	Yelloweye Rockfish	No minimum size
2	9	7 rockfish one of which can be a Canary Rockfish; 2 Cabezon; 2 Lingcod	Yelloweye Rockfish	No minimum size
3	9	7 rockfish; 2 Cabezon; 2 Lingcod	Yelloweye Rockfish; Canary Rockfish	No minimum size
4a	9	7 rockfish; 1 Cabezon; 2 Lingcod	Yelloweye Rockfish; Canary Rockfish	Cabezon 18"
4b	10	6 rockfish; 1 Cabezon; 2 Lingcod	All rockfish except Black and Blue Rockfish	Cabezon 18"

Table 3. Number of recreationally targeted groundfish species (number of individuals) landed at primary Washington ports from 2014-2017. Data is summarized from OSP landing estimates.

	Charter	Private	Coastwide Total
Chinook		2,361	2,361
Ilwaco	59,445	27,470	86,914
La Push	21,807	134,782	156,589
Neah Bay	35,071	323,951	359,022
Westport	783,968	101,569	885,537
Total	900,291	590,133	1,490,424

Table 4. Washington Coast landings of recreationally targeted groundfish species by number of individuals from 2014-2017. Miscellaneous category includes Widow Rockfish along with other groundfish species. Blue Rockfish and Deacon Rockfish were not separated in OSP estimates and all were categorized as Blue Rockfish.

	Chinook	Ilwaco	Westport	La Push	Neah Bay	Coastwide Total
Black Rockfish	1,914	69,144	655,406	126,235	262,689	1,115,389
Blue/Deacon Rockfish		188	1,792	955	3,685	6,620
Bocaccio Rockfish		3	451	36	191	681
Cabazon	67	847	916	1,527	5,373	8,731
Canary Rockfish		649	3,231	49	327	4,257
China Rockfish	1	36	85	1,023	6,706	7,851
Copper Rockfish	1	95	436	159	2,828	3,519
Kelp Greenling	113	1,080	1,352	1,298	10,708	14,551
Lingcod	114	6,486	96,520	22,823	54,071	180,014
Miscellaneous	82	1,596	10,194	255	1,182	13,309
Quillback Rockfish		276	1,537	187	1,954	3,953
Tiger Rockfish		145	41	68	239	492
Unidentified Rockfish	69	126	203	46	81	525
Vermilion Rockfish		32	11	50	2,055	2,148
Yelloweye Rockfish		1	10	3	56	70
Yellowtail Rockfish		6,210	113,354	1,872	6,878	128,314

Table 5. Total number of fish released with internal tags in the nearshore groundfish survey from 1998 to 2017 by Marine Area and tag type.

	CWT Only	CWT/PIT	PIT Only	Total
Marine Area 1	0	1232	15	1247
Marine Area 2	34530	39678	1399	75607
Marine Area 3	0	4527	321	4848
Marine Area 4	2	5142	769	5913
Total	34532	50579	2504	87615

Table 6. Annual Washington coast minimum biological data collection goals from recreational catch for 2014 to 2016.

	Type of Biosample	La Push	Neah Bay	Westport	Coast Total
Black Rockfish	Length, sex, otolith	350	350	550	1250
Lingcod	Length, sex, fin ray	275	275	250	800
All other recreationally targeted groundfish	Length, sex, otolith, weight	350	350	350	1050

Table 7. 2017 Washington coast minimum biological data collection goals from recreational catch; * indicates that all individuals encountered should be sampled.

	Type of Biosample	La Push	Neah Bay	Westport	Coast Total
Black Rockfish	Length, sex, otolith	270	270	540	1080
Lingcod	Length, sex, finray	270	270	540	1080
Widow Rockfish	Length, sex, otolith	*	*	600	1050
Yellowtail Rockfish	Length, sex, otolith	*	*	600	1050
All other recreationally targeted groundfish	Length, sex, otolith, weight	*	*	*	1050

Table 8. Number of days spent sampling at each port by RGSP dockside samplers, 2014 to 2017. (Totals days only and does not sum multiple RGSP samplers staffing the port).

	Westport	La Push	Neah Bay
2014	84	60	80
2015	82	74	88
2016	80	33	50
2017	85	28	70

Table 9. Total age structures collected by RGSP dockside staff from 2014 to 2017. OSP collections at Neah Bay are included. Age structures collected from recovered tagged fish and other special projects are not reported here.

	La Push	Neah Bay	Westport	Total
Vermilion Rockfish	6	354	2	362
Copper Rockfish	24	382	85	491
Blue/Deacon Rockfish	113	710	576	1399
Quillback Rockfish	16	209	848	1073
Cabazon	120	397	221	738
China Rockfish	217	763	42	1022
Kelp Greenling	78	647	85	810
Widow Rockfish	4	12	2054	2070
Lingcod	696	1236	1680	3612
Yellowtail Rockfish	72	387	2677	3136
Black Rockfish	1416	2059	2797	6272
Canary Rockfish	7	14	1189	1210
Other Rockfish Species	18	61	130	209
Total	2787	7231	12386	22404

Table 10. Number of fish by species scanned for internal tags on the Washington coast from 2014 to 2017. Blue Rockfish and Deacon Rockfish were not separated until 2016 and are combined here.

	2014			2015			2016	2017
	Westport	La Push	Neah Bay	Westport	La Push	Neah Bay	Westport	Westport
Vermilion Rockfish	1	1	111	0	6	209	0	1
Copper Rockfish	17	13	207	12	12	150	32	24
Blue/Deacon Rockfish	56	94	114	37	186	323	701	275
Quillback Rockfish	215	16	156	182	18	137	240	211
Cabazon	42	171	297	28	139	364	69	88
China Rockfish	14	167	543	11	121	513	5	7
Kelp Greenling	16	164	652	13	112	510	31	29
Widow Rockfish	4372	0	19	1061	0	6	563	1644
Lingcod	7871	2235	2707	8113	1565	2176	11761	12103
Yellowtail Rockfish	12550	64	298	12936	148	587	17763	19676
Black Rockfish	76815	14803	16738	99597	16220	16677	108921	61220
Canary Rockfish	0	3	30	0	1	15	0	1757
Other Rockfish Species	12	12	34	13	8	19	20	81
Total	101981	17743	21906	122003	18536	21686	140106	97116

Table 11. Number of tagged fish recovered from RGSP dockside sampling from 2014 to 2017.

	2014			2015			2016	2017
	Westport	La Push	Neah Bay	Westport	La Push	Neah Bay	Westport	Westport
Black Rockfish	335	7	12	377	5	12	261	145
Blue/Deacon Rockfish	1						2	
China Rockfish			1					
Lingcod	4			4			2	
Widow Rockfish	2							
Yellowtail Rockfish	1			5		1	2	
Copper Rockfish						1		
Total	343	7	13	386	5	14	267	145

Figures

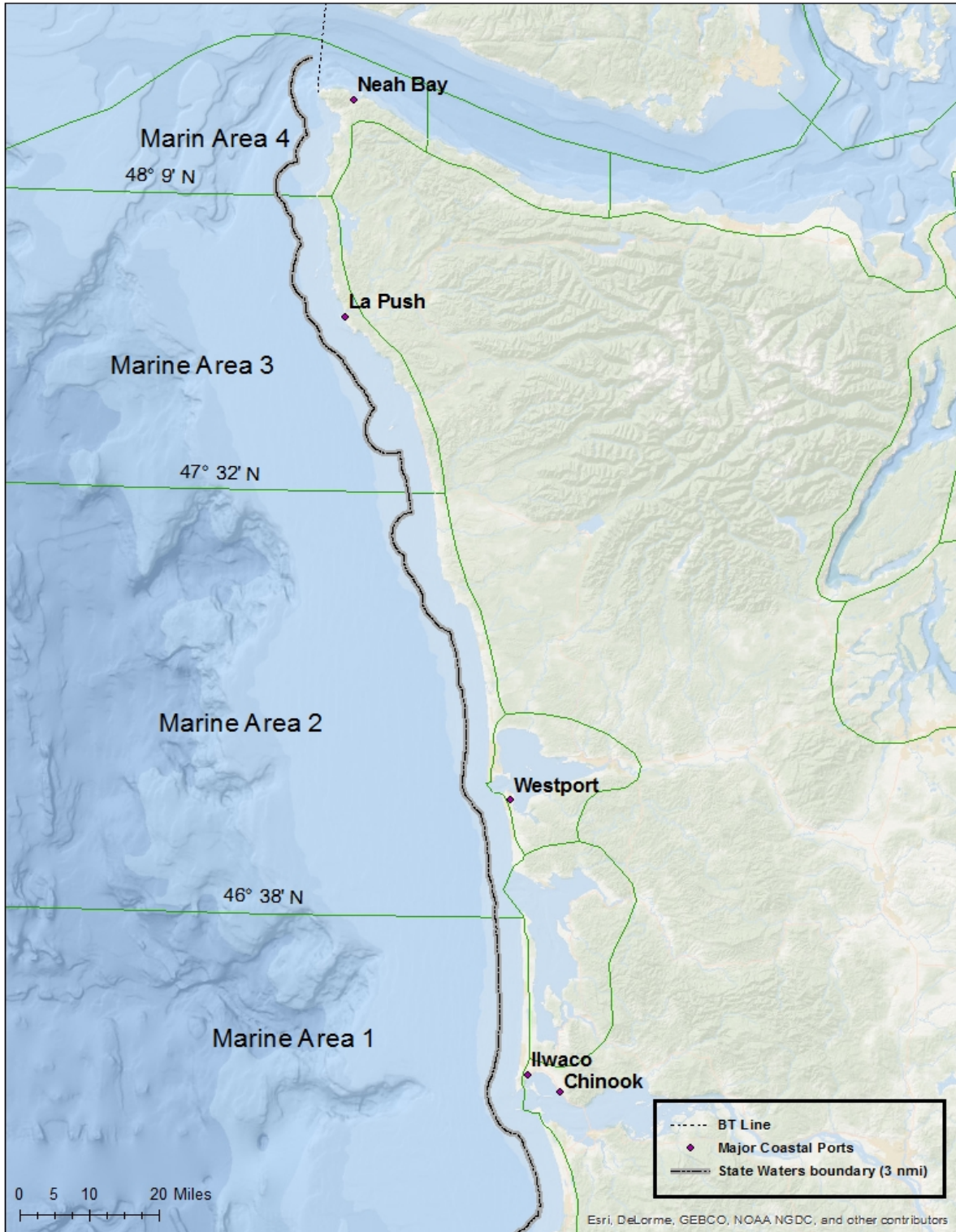


Figure 1. Major recreational coastal ports of Washington and associated Marine Areas.

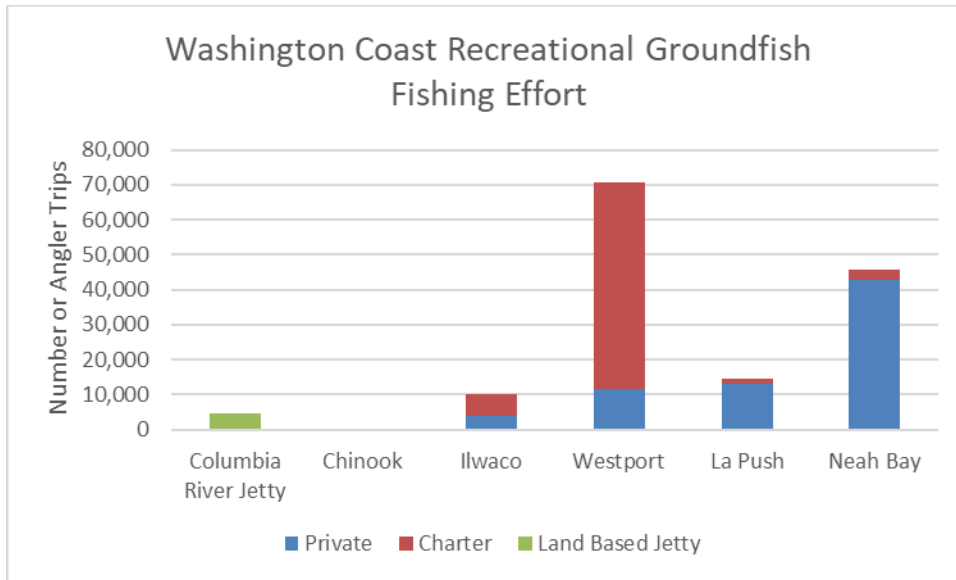


Figure 2. Number of recreational angler trips targeting groundfish by port of landing from 2014 to 2017. Trips that targeted only groundfish (coded as bottomfish trips) are included here; trips that targeted salmon, halibut or tuna as well, i.e., “combo trips” are not included.

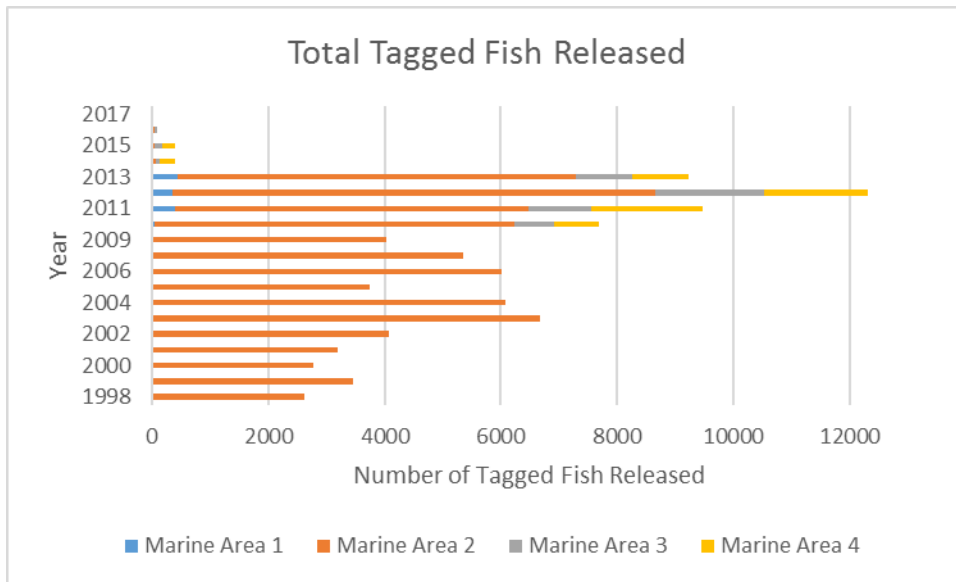


Figure 3. Total number of tagged fish released by Marine Area from 1998 to 2017 on the MFS nearshore survey.



Figure 4. Tag detection equipment used by RGSP dockside samplers: A) R8000 B) Destron with tabletop antenna C) 601 Handheld reader D) Handheld CWT wand.

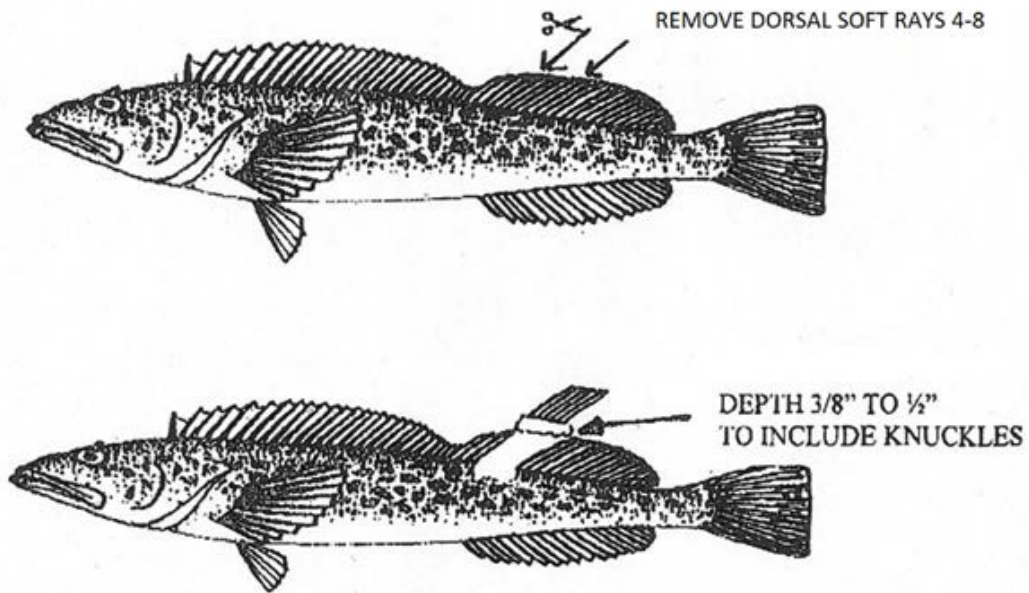


Figure 5. Lingcod fin ray collection diagram

Total Number of Individual Fish Weights Collected

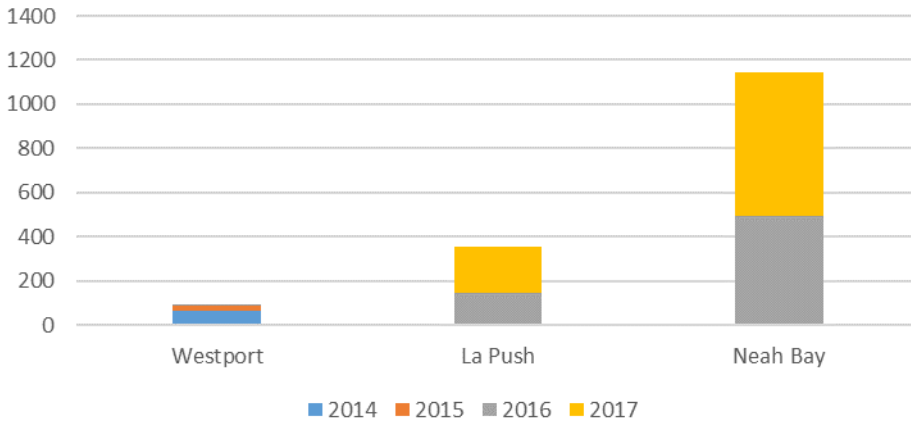


Figure 6. Number of individual groundfish weights collected by RGSP dockside samplers from 2014 to 2017.

Number of Age Structures Collected

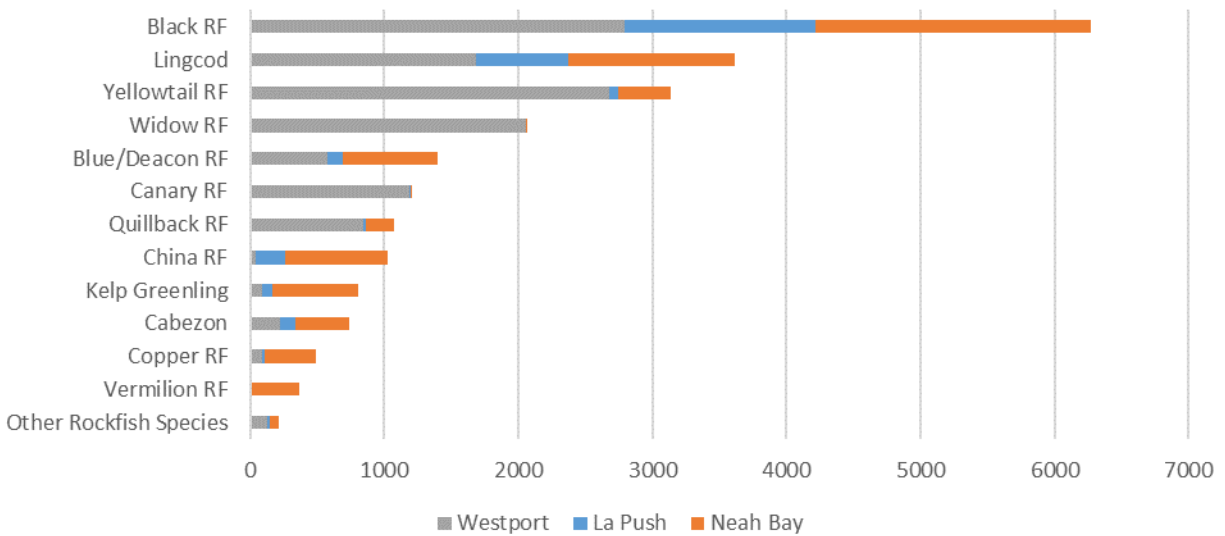


Figure 7. Number of age structures collected by the RGSP from 2014 through 2017. OSP collections at Neah Bay are included. Age structures collected from recovered tagged fish and other special projects are not reported here.

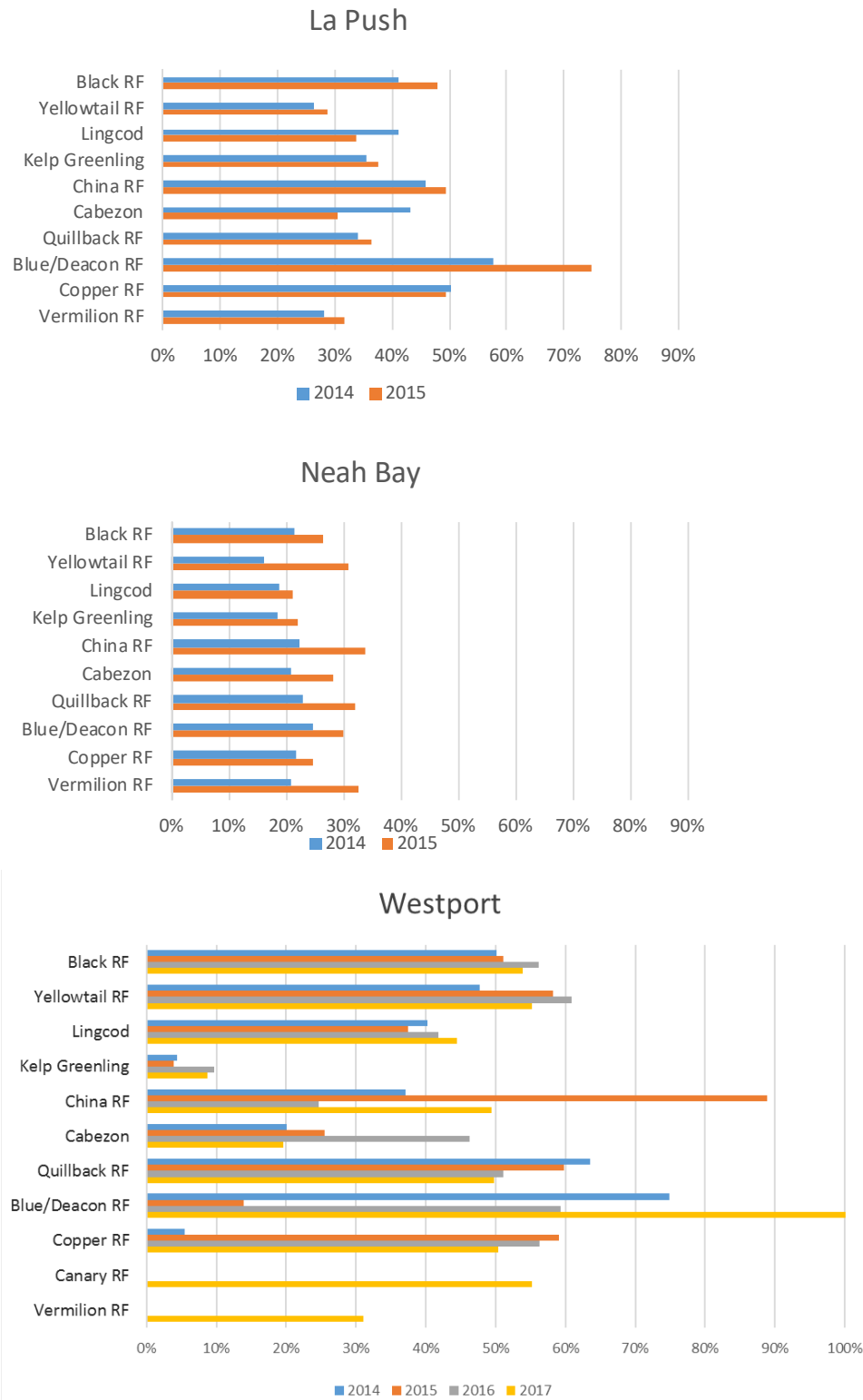


Figure 8. Estimated percentage of total recreational groundfish landings scanned for internal tags. Total landings by number were derived from OSP estimate data for the three ports. The percentage of Widow Rockfish landings scanned could not be calculated because the OSP does not produce separate estimates of Widow Rockfish.

Appendix A.

Evaluation of the Recreational Groundfish Sampling Program's Dockside Sampling Strategy of the Westport Charter Groundfish Fishery

By common practice the Westport charter fleet fillets customers' groundfish catch during the return trip to port. Because Washington's recreational groundfish fisheries have species-specific limits, regulations require the carcasses of filleted fish to be kept onboard until arrival back at port. The WDFW Marine Fish Science (MFS) group aligned its tag recapture program and subsequent Recreational Groundfish Sampling Program (RGSP) with this practice and requirement by establishing a dockside station – the RGSP barge – to take delivery of groundfish carcasses for sampling. For the purposes of this report, the term “groundfish” is used specifically to refer to groundfish species that are typically targeted by coastal recreational anglers including rockfish, Cabezon, Kelp Greenling, and Lingcod.

Charter vessels are not required to deliver groundfish to the RGSP barge; it is strictly voluntary. However, most charter vessels do participate in the carcass-sampling program, although it is not uncommon for a charter to make a partial delivery to the barge, while keeping some fish onboard. This can be due to a variety of reasons linked to serving their customers: e.g., to enter large fish into a derby, customer preference for whole fish, or simply because not all the fish were filleted by the time the vessel reached port. Because the number of RGSP staff is limited (typically two per shift) and the quantity of carcasses to process is substantial, sampling is restricted to the carcasses delivered voluntarily to the barge. Following a vessel beyond the barge to sample any catch that is retained or remains onboard is impractical.

Once a charter vessel returns to its slip, the WDFW Ocean Sampling Program (OSP) may intercept it to interview the captain or crew. As part of the catch estimation process for groundfish, the OSP records the number of anglers onboard and the total number of groundfish caught by species (or category) as reported to them by the charter captain or crew. These interviews occur after fish carcasses have been delivered to the barge and, due to time constraints, OSP staff typically do not inspect whole groundfish or any carcasses that may remain onboard.

These operational constraints, coupled with concerns for potential differences between the species composition of groundfish delivered to the RGSP barge and the OSP groundfish catch estimate of the Westport charter fleet, prompted a short study to investigate possible sampling bias. The primary objective of this study was to describe and compare the species compositions

and size distributions of groundfish delivered to RGSP staff and groundfish retained by the charter vessels.

Estimating the species composition of groundfish landed by the recreational fleet has not been a standard objective of the RGSP and new methods were initiated to capture this data. Starting in 2016, all groundfish delivered to the RGSP barge were tallied and recorded by vessel and any groundfish catch that was retained on the vessel was estimated through interviews with each vessel's crew as the carcasses were offloaded. Additionally, during the 2017 groundfish season RGSP staff independently sampled the catch that was not delivered, collecting species composition and biological data.

Over 42 sampling days, from April through September of 2017, all catch retained by vessels that delivered partial loads to the barge was verified by a RGSP sampler dedicated to this study. Vessels that indicated that they were not offloading all groundfish onboard were subsequently approached by the study sampler, in order of delivery, once the vessels were back at their slips. The groundfish that remained onboard were then tallied by species and a subset was randomly chosen for length (fork length) data collection. The study sampler independently identified, counted, and recorded species separately by vessel. All data were written in 'Rite in the Rain' notebooks and entered into an Excel spreadsheet at the office.

The Westport charter fleet delivered over 91,000 individual groundfish to the RGSP barge in 2017 (Table 1). This accounted for 61% of the OSP estimated Westport charter landings of groundfish species that are differentiated by the OSP. Recreational groundfish landings in Westport are dominated by Black Rockfish and, to a lesser extent, Lingcod and Yellowtail Rockfish. Species diversity of charter catch delivered to the RGSP barge in 2017 was almost identical to the OSP charter landings estimates with only 2 percentage point differences between Black Rockfish and Lingcod (Figure 1). Notably, 1605 Widow Rockfish were delivered to the RGSP barge in 2017, but this species is lumped in OSP estimates into a miscellaneous category and cannot be compared.

Table 1. Number of individuals delivered by charter vessels to the RGSP Barge and estimated landings of the Westport charter fleet in 2017. Only groundfish species differentiated by the OSP are reported here.

Species	Barge Delivered Catch	OSP Charter Landings Estimate	Percent of Landings Delivered
Yelloweye Rockfish	2	0	
Bocaccio Rockfish	9	10	87%
China Rockfish	7	11	64%
Tiger Rockfish	13	15	85%
Copper Rockfish	23	28	82%
Kelp Greenling	26	35	74%
Cabezon	77	166	47%
Blue/Deacon Rockfish	270	267	101%
Quillback Rockfish	193	331	58%
Canary Rockfish	1,689	2,584	65%
Lingcod	11,610	21,894	53%
Yellowtail Rockfish	18,834	31,973	59%
Black Rockfish	58,882	93,023	63%
Total	91,635	150,337	61%

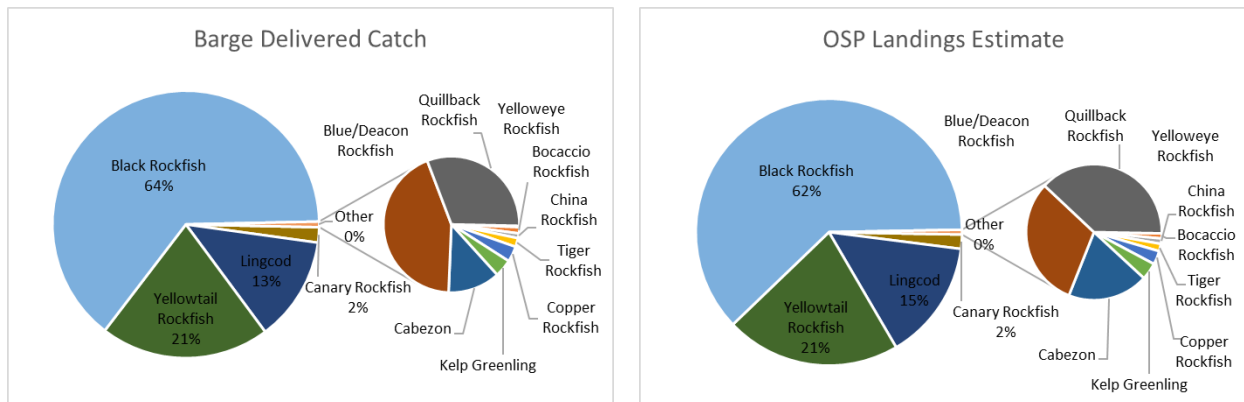


Figure 1. Species composition of charter catch by number delivered to the barge (left) and OSP estimate of Westport charter landings (right). Only groundfish species differentiated by the OSP are reported here.

RGSP barge staff interviews of charter vessels in 2017 indicated that 5,623 individual groundfish were kept onboard, representing fish typically unavailable for sampling. This corresponds to approximately 5.5 percent of the catch of delivering vessels. In comparison to this total groundfish undelivered estimate, Lingcod was estimated at a much higher retention rate of 10.2 percent of total Lingcod landings by delivering vessels. Retained rockfish estimates were reported at 4.7 percent of total rockfish landings by delivering vessels. To avoid possible misidentification by the vessel crew, rockfish were documented at a broad taxonomic level, as unidentified rockfish. This prevented any comparisons of delivered/undelivered rockfish compositions at the species level. In the 2017 study, RGSP samplers were able to confirm the

species composition of 2,486 individual groundfish that were not delivered to the barge or 44 percent of the vessel's estimate of retained catch.

Observed differences between the species compositions of delivered and undelivered catch sampled by RGSP was mostly driven by a much larger proportion of Lingcod in the retained catch (Figure 2). Also, Canary Rockfish and other minor rockfish species that make up less than one percent of landings comprised a slightly higher proportion in the undelivered catch.

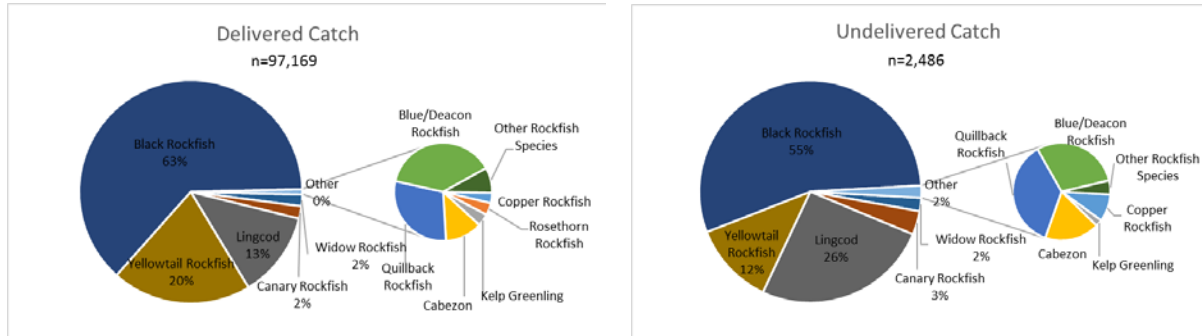


Figure 2. Species composition of groundfish delivered to the RGSP barge (left) and species composition of undelivered groundfish confirmed by MFS samplers (right) in 2017.

Black Rockfish and Lingcod were randomly subsampled from the observed retained catch for length data collection and all individuals any other species encountered were measured when possible. Length frequencies of the most encountered species including Black Rockfish, Yellowtail Rockfish, Canary Rockfish and Lingcod are summarized in Figure 3. Differences between delivered and undelivered species' average lengths were not found to be significantly different with independent-samples *t*-tests at a 95% confidence level, except for Yellowtail Rockfish ($P < 0.01$). The mean length of retained Yellowtail Rockfish (41.9 cm, $SD = 5.6$ cm) was 1.5 centimeters larger than the mean length of delivered Yellowtail Rockfish (40.4 cm, $SD = 5.5$). Also, while the mean length between delivered and undelivered Lingcod was not found to be significantly different ($P = 0.065$), it is worth noting that the mean length of retained Lingcod (71.8 cm, $SD = 17.0$) was 2.5 centimeters larger than the mean of delivered Lingcod (69.3, $SD = 11.7$) and all Lingcod measuring more than 106 centimeters were not offloaded to the barge.

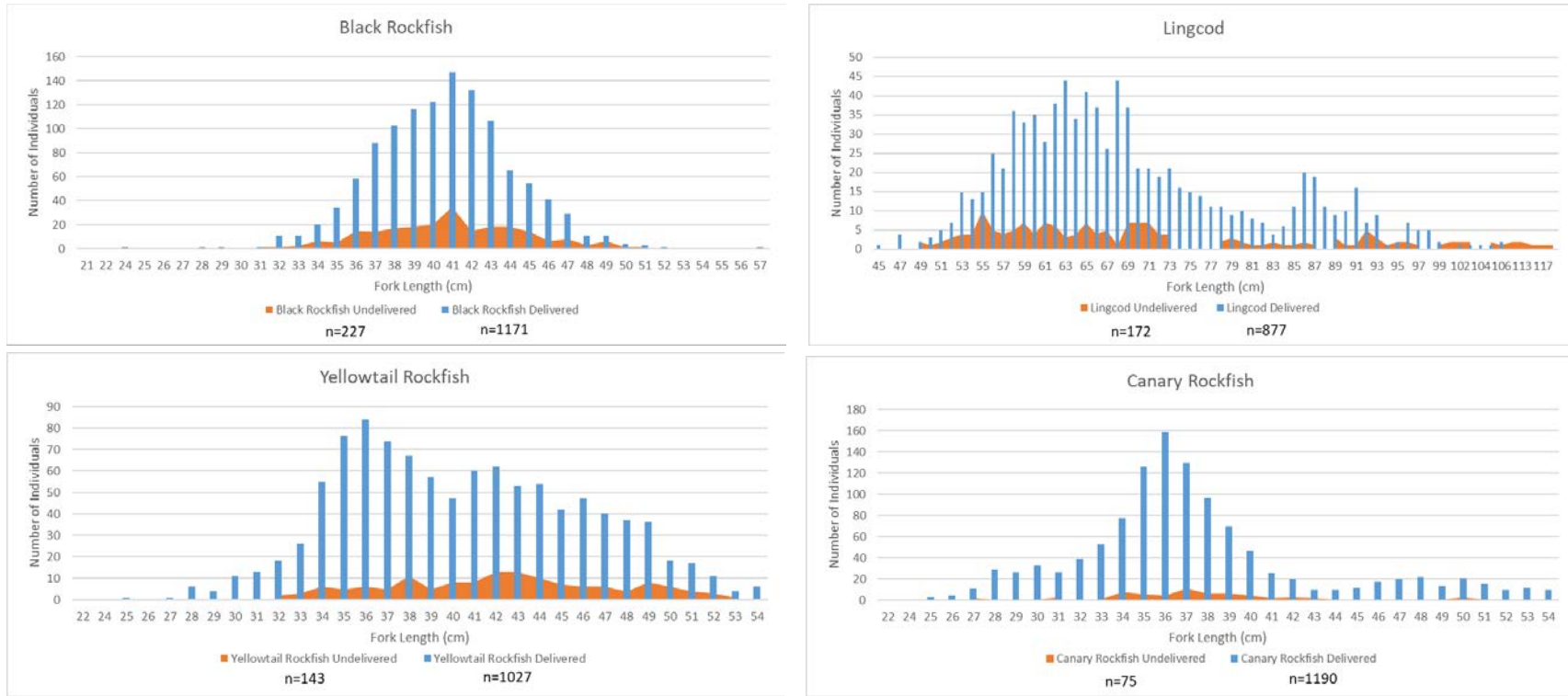


Figure 3. Length frequency of the four most encountered groundfish species by RGSP samplers in 2017. Lengths are separated by catch delivered to the barge and sampled undelivered catch.

The large number of groundfish delivered to the RGSP barge and the similarity between the species compositions of fish delivered to the RGSP barge and the OSP charter groundfish landing estimates corroborate the two sampling systems. However, the high percentage (101%) of estimated Blue/Deacon Rockfish landings delivered to the RGSP barge (Table 1) indicates an underreporting of this species by the Westport charter fleet in 2017.

Slight differences between the compositions of fish held onboard versus the fish delivered to the barge were mostly insignificant due to the estimated low groundfish retention rate of 5.5 percent by delivering vessels. The observed differences are likely due to angler related factors reducing the filleting and therefore delivery of some species for sampling. Lingcod are generally the last groundfish to be filleted on the return to port making them more likely to still be in the round when the vessel arrives at the barge. These round fish and larger Lingcod, which are purposefully landed whole for weighing in the weekly Westport Lingcod derby, are kept onboard for filleting back at the vessel's slip. Additionally, some customers prefer to retain rockfish whole, in particular the minor rockfish species, for meal preparation. While the modest estimated groundfish retention rate ameliorates the effect of the minor differences in species compositions and Yellowtail Rockfish size on total landing estimates, the 2.5 centimeters difference in size of Lingcod coupled with an estimated Lingcod retention rate of 10.2 percent could be a significant source of bias when attempting to describe total landings.

Further study increasing the sample sizes of lengths from groundfish not delivered to the RGSP by participating charter vessels would be useful to increase the confidence of this study. In addition, an assessment of the cost and logistical needs to include all Lingcod in the RGSP's dockside sampling frame at Westport should be conducted.



This program receives Federal financial assistance from the U.S. Fish and Wildlife Service Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, Title II of the Americans with Disabilities Act of 1990, the Age Discrimination Act of 1975, and Title IX of the Education Amendments of 1972. The U.S. Department of the Interior and its bureaus prohibit discrimination on the bases of race, color, national origin, age, disability and sex (in educational programs). If you believe that you have been discriminated against in any program, activity or facility, please contact the WDFW ADA Program Manager at P.O. Box 43139, Olympia, Washington 98504, or write to

Department of the Interior
Chief, Public Civil Rights Division
1849 C Street NW
Washington D.C. 20240