

# 2020-2022 Report to the Legislature

**Status of Rockfish Research and Conservation Programs:  
July 2020 through June 2022**

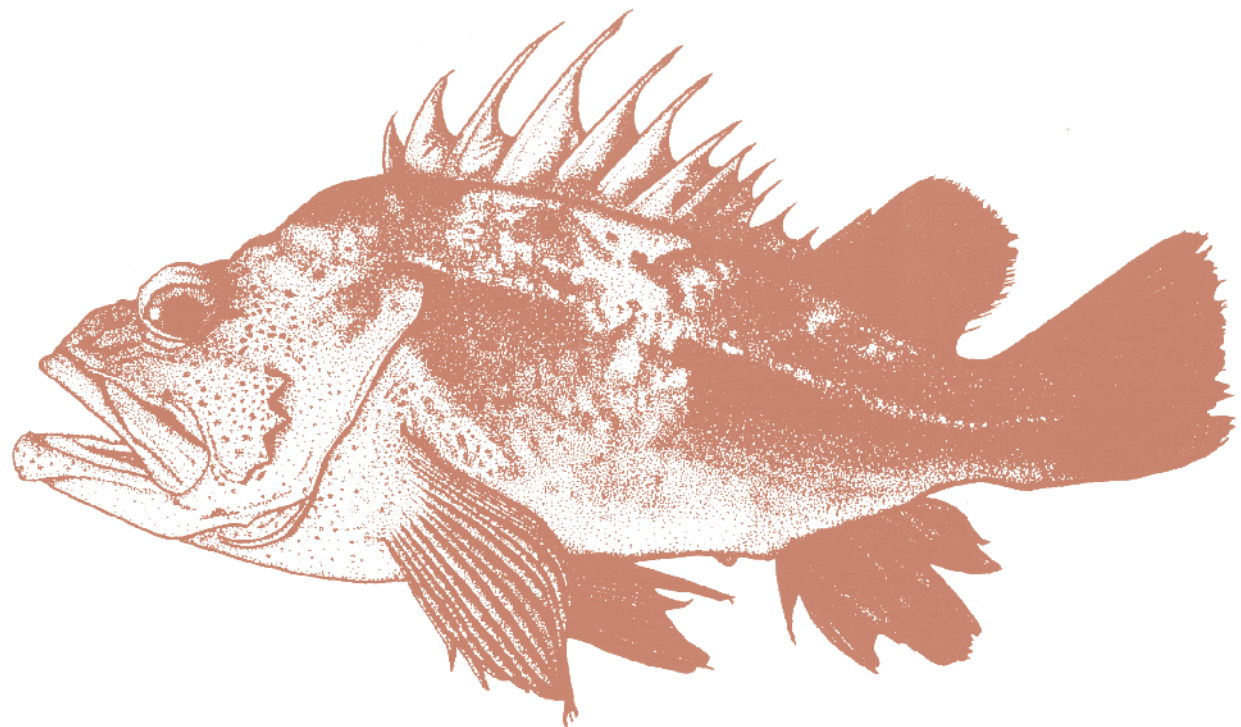


**Washington Department of Fish and Wildlife  
December 2022**

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State of Washington  
**DEPARTMENT OF FISH AND WILDLIFE**

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Dear Senator Van De Wege and Representative Chapman,

I am pleased to submit the Washington Department of Fish & Wildlife's seventh biennial report to the Legislature on the status of its rockfish research and stock assessment activities in Puget Sound and the coast, as required by RCW 77.12.702.

The Legislature directed the Department to use funds in the rockfish research account to develop and implement a research and stock assessment program for rockfish. Since then, the Department, in collaboration with other state, federal and non-government entities, has realized significant achievements that otherwise could not have been accomplished. Foremost among these are the rebuilds of six federally declared overfished rockfish species on the coast and delisting of an ESA listed species, Canary Rockfish, in Puget Sound.

The enclosed report describes the projects/activities funded by the account in FY2021 and FY2022, and how they are contributing to the establishment of much needed long-term monitoring and assessment programs for coastal and Puget Sound rockfish populations. During this reporting period, a long-term monitoring program for coastal rockfish was implemented and critical habitats for Rockfish in Puget Sound were surveyed in order to support mapping species distribution and estimating current population status. Due to COVID-19, the FY2021 projects were either delayed until FY2022 or cancelled. The Department will continue efforts to recover the remaining overfished species on the coast and ESA-listed species in Puget Sound.

Thank you for your interest in rockfish management in Washington. If you have any questions or concerns about the report or the Department's rockfish research and stock assessment activities, please feel free to contact Tom McBride, WDFW's Legislative Director, at (360)480-1472.

Sincerely,

Kelly Susewind  
Director

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Barbara Baker, Chair, Washington Fish and Wildlife Commission.

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## Executive Summary

House Bill 1476 (2007) provides the funding for the Department of Fish and Wildlife to develop and implement rockfish research and stock assessment projects. During fiscal years 2021 and 2022 the Department's Marine Fish Science Unit has used these funds to conduct surveys and biological studies to support federal and state stock assessment and management needs. Highlights of the work completed over the past two fiscal years include:

1. *the coastal rockfish rod-and-reel survey used to create indices of abundance for use in coastal rockfish stock assessments,*
2. *the Puget Sound rocky habitat survey for ESA listed rockfish species needed to support NOAA recovery plans,*
3. *the coastal Yelloweye Rockfish setline survey used for improved monitoring of abundance changes,*
4. *the coastal Yelloweye Rockfish recreational fishery discard study used to improve fishery impact evaluation, and*
5. *an on-line survey developed to evaluate the effectiveness of WDFW public education and outreach on rockfish identification. These highlights show the diversity of new work accomplished in fiscal years 2021 and 2022.*

This report will provide descriptions for the activities mentioned above, other ongoing research, and new initiatives proposed for fiscal years 2023 and 2024.

## Introduction

In 2007, the Washington State Legislature approved House Bill 1476, creating a Rockfish Research Account (RRA) to fund increased monitoring of rockfish abundance and distribution in state waters. This bill was needed as a result of the significant decline in the past half century of many rockfish species residing in Washington marine waters. Progressively from 1999, seven rockfish species were federally designated as "overfished" on the West Coast,

followed in 2010 by the listing of three species in Puget Sound and the southern Strait of Georgia under the federal Endangered Species Act (ESA). Funded by surcharges on commercial and recreational fishing licenses, revenues from the Rockfish Research account have helped the Washington Department of Fish and Wildlife (WDFW) to greatly expand its understanding of these vulnerable marine fish and their habitats. The Department, in collaboration with other state, federal, and non-government entities, has realized significant achievements that otherwise could not have been accomplished. These achievements include rebuilds of six federally declared overfished rockfish species on the coast, and delisting of an ESA listed species, Canary Rockfish, in Puget Sound. Since 2008, WDFW has reported to the Legislature every other year on the status of rockfish stock assessment research and fishery management efforts. This report is the latest in that series, providing an update on the current status of rockfish stock assessment capabilities, research projects conducted in FYs 2021 and 2022, and future plans for research by the Department.

**Recent research highlights supported, in full or in part, by revenues from the Rockfish Research Account (RRA) include:**

**Surveying Coastal Rockfish with Rod and Reel:** A standardized rod-and-reel abundance survey was conducted in the spring of 2019, 2020, 2021 and 2022, and in the fall of 2019 and 2021. These surveys will serve as long-term monitoring tools for stock abundance of multiple rockfish species and will allow for the collection of necessary biological data to support stock assessments for Washington's coastal rockfish.



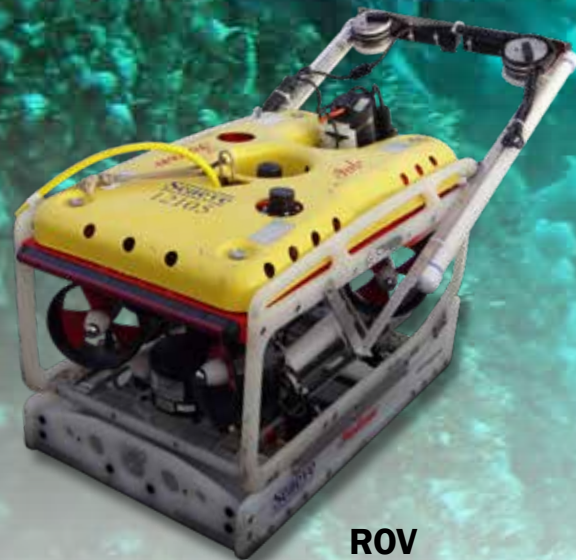
**Sampling High-relief and Rocky Habitats in Puget Sound with an ROV:** A small remotely operated vehicle (ROV) was used to complete a survey of adult rockfish habitat throughout the southern Salish Sea. The resulting data are used to develop estimates of abundance for rocky reef associated species including Yelloweye Rockfish and Bocaccio, which are listed under the ESA. The survey design was informed by recently developed species distribution models for ESA-listed rockfish, which has greatly increased the efficiency of the ROV surveys, improved the overall detection of relatively rare species, and increased the precision of ensuing abundance estimates.

**Enhanced Yelloweye Recreational Fishery Biological Sampling Project:** Yelloweye Rockfish biological information is limited due to regulations prohibiting the retention of this species in Washington's fisheries. The goal of this project is to better inform the biological characterization of discarded Yelloweye Rockfish by allowing selected recreational anglers to retain Yelloweye Rockfish caught incidentally during open recreational fisheries. Fish are delivered whole to WDFW for biological sampling. Data collected from this project will be used to inform the coastal Yelloweye Rockfish stock assessment.



**Evaluating Rockfish Outreach and Education Efforts:** Since 2012, the WDFW has spent considerable time and money designing and distributing fish identification guides, building a webpage for marine fish identification, and posting rockfish conservation and species identification signs at prominent fishing locations. An online survey was developed to determine how proficient anglers are at identifying rockfish, understanding rockfish biology and their habitat requirements, and

**continued next page**



ROV

**General background information about rockfish resources, a management overview, and ongoing research projects supported by the RRA can be found in the appendix of this document. New initiatives supported by the RRA and research activities proposed for July 2020 to June 2022 are outlined in the sections below.**






## Initiatives During FYs 2021 and 2022 Supported by the Rockfish Research Fund

In establishing the RRA, the Legislature found that “improved survey information is essential for assessing abundance and to monitor progress toward rebuilding efforts on the coast and in Puget Sound.” It also recognized that both “new and existing technology” have important roles to play in this effort.

related fishing regulations. The survey will be advertised and distributed to licensed saltwater anglers in FY2023 in a limited-duration online format, the results of which will be analyzed in conjunction with NOAA Fisheries and University of Washington research faculty to evaluate the effectiveness of WDFW outreach efforts in promoting recovery of ESA-listed rockfish in Puget Sound within the recreational angling community. In establishing the RRA, the Legislature found that “improved survey information is essential for assessing abundance and to monitor progress toward rebuilding efforts on the coast and in Puget Sound.” It also recognized that both “new and existing technology” have important roles to play in this effort.

 **Impact of Covid-19 on WDFW Surveys:** Surveys supported by the RRA that were cancelled, reduced or postponed between July 2020 and June 2022 due to the Covid-19 pandemic include the fall coastal rod and reel index survey in 2020, the 2020 and 2021 Puget Sound ROV survey, and juvenile rockfish biological data collection. At the second fiscal year of this reporting period all WDFW staff have been vaccinated against Covid-19 and surveys and sampling were back to regular scheduling



### Scientific Surveys

#### Coastal Rockfish Rod-and-Reel Abundance Survey (partial RRA support)

Black Rockfish make up the majority of recreational bottomfish catch each year along the Washington coast, a suite of monitoring programs, both fisheries-dependent and -independent, are essential for informing management of this important and highly utilized resource. Traditionally, managers have relied on the use of fishery catch-per-unit-effort (CPUE) data to inform the decision-making processes, but this type of data alone may be insufficient for assessing rockfish species. Fisheries-independent surveys, such as multispecies nearshore rockfish surveys, are vital.

From 2014 through 2018 the WDFW initiated a series of experimental rod-and-reel fishing surveys designed to gain knowledge of nearshore rockfish distribution, seasonality, and their reactions to fishing gear. Based on the results, we concluded that two separate surveys are needed: one targeting pelagic schooling rockfish in spring and the other targeting demersal (bottom-dwelling) species in fall. The designs of the spring and fall surveys were standardized and sampling began in 2019. Spanning the entire Washington coast, 125 index stations are sampled each year in the spring survey and 64 index stations are sampled in

the fall survey (Fig. 1). Due to the Covid-19 pandemic the fall survey of 2020 was cancelled, and no data is available. The catch composition of the spring surveys in 2021 and 2022 were dominated by pelagic schooling rockfish, such as Black, Deacon, and Yellowtail Rockfish. The 2021 fall demersal survey catch was also dominated by Black Rockfish, however the composition of the catch was more diversified and included higher percentage of demersal rockfish, like China Rockfish, compared to spring survey catches (Fig. 2).

The coastal rod-and-reel survey is an effective, fisheries-independent, standardized survey for rockfish populations which, over time, managers can use to compare annual results to evaluate changes in nearshore rockfish relative abundance. Biological data collected during these surveys also inform age and mortality estimates for use in modeling coastal populations of rockfish.

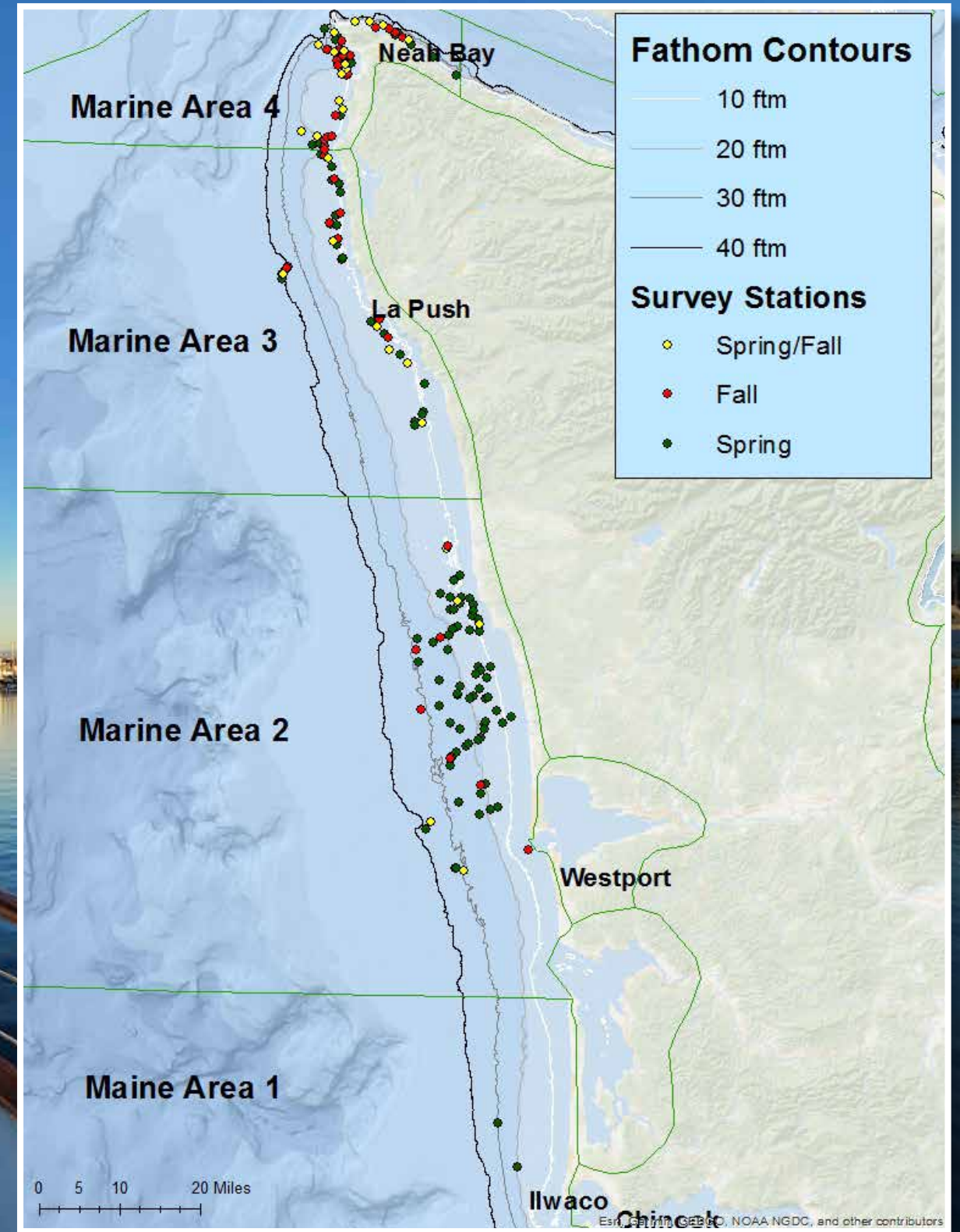
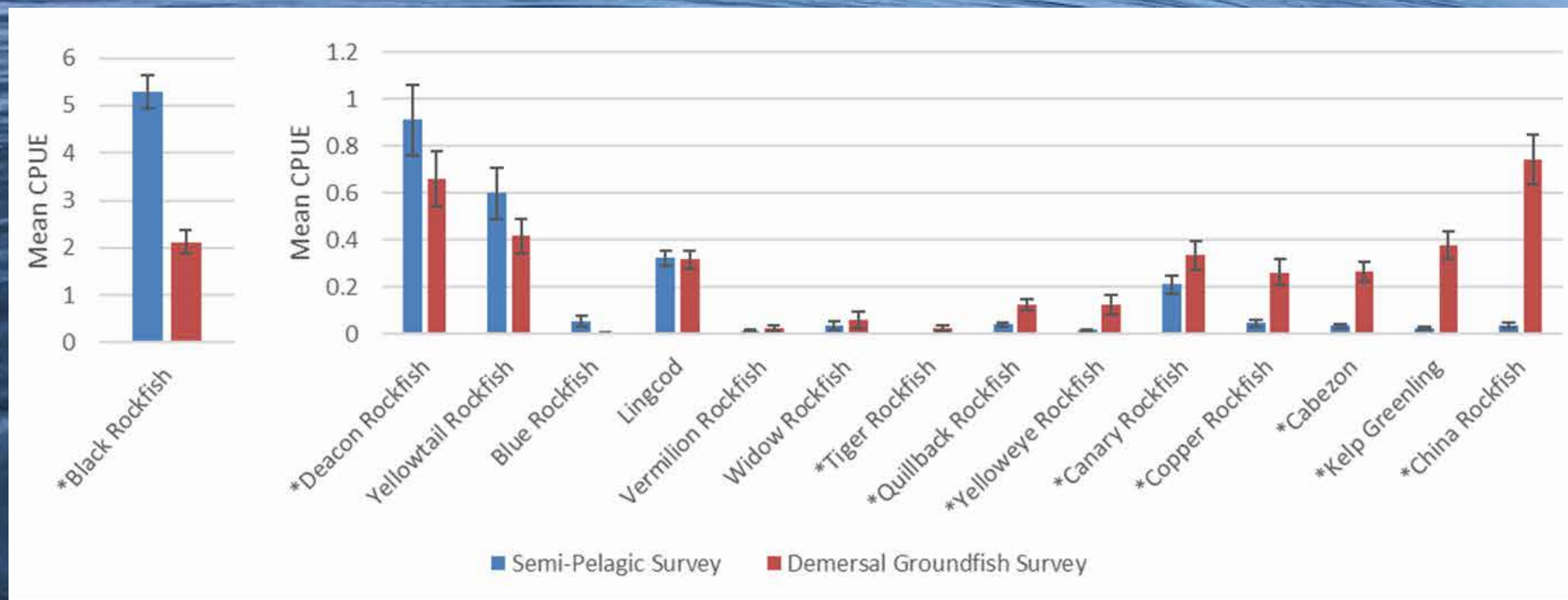


Figure 1. Rod-and-reel survey stations on the Washington coast. Stations are indicated by Spring (pelagic) and Fall (demersal) surveys with some stations included in both surveys.



**Figure 2. Average CPUE (number of individuals per rod hour) of stations fished in the pelagic (spring) and demersal (fall) surveys in 2019, 2021, and 2022. \*P<0.01 from Wilcoxon rank-sum test.**

**Sampling High-relief and Rocky Habitats in Puget Sound with an ROV (partial RRA support)**

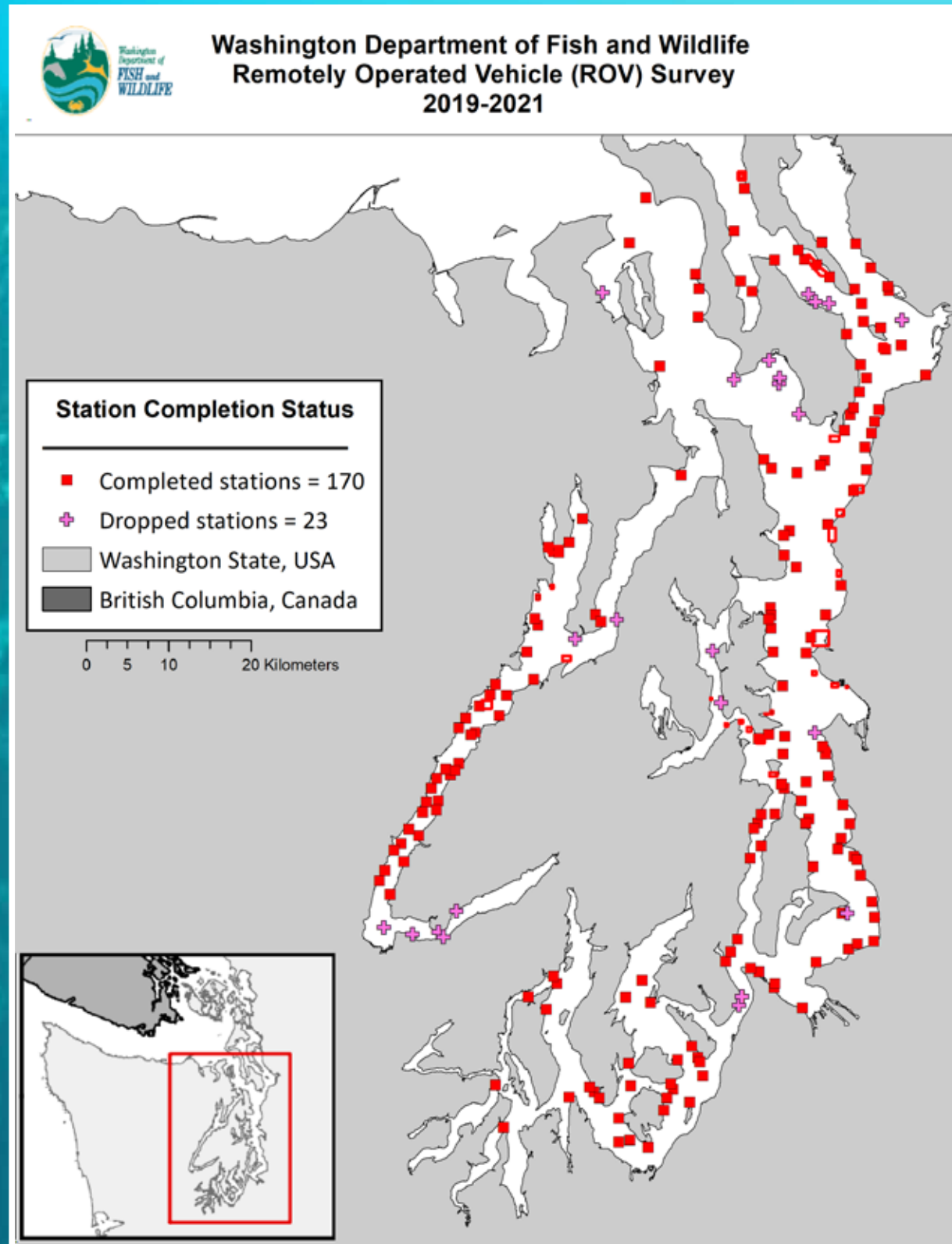
An ROV survey designed to estimate the abundance of rocky habitat-associated species within the interior marine waters of Washington was initiated on August 6, 2019. The survey design was informed by a Maximum Entropy species distribution model, which identifies the area where rockfish and other key species of interest are most likely to inhabit, based on the presence of bathymetric features. ROV sampling occurred within the region where 95% of the

target species were predicted to occur, and was randomly stratified among the high, medium, and low probability habitats within that region. This sampling strategy has enabled more precise estimates of abundance with less overall sampling effort than previously applied sampling designs, such as those based on a fixed grid. Staff from the WDFW Marine Fish Science Unit completed 97 of 450 planned stations before an equipment failure on the support vessel suspended the survey in late September 2019. The WDFW acquired a replacement vessel, the 17 m R/V Salish Rover, in December 2019. Vessel repairs

and outfitting were completed in June 2020, followed by a series of sea trials in July and August, and the survey re-commenced in October 2020.

Due to the loss of survey time from pandemic-related restrictions, program management constrained the geographic scope of the survey to all waters south of Admiralty Inlet which reduced the number of planned survey stations to 193. While the loss of such a large portion of the survey was a setback for obtaining critically needed rockfish data, the constrained survey did allow for the collection of a dataset comparable to the 2015-16 ROV survey of Puget Sound that could facilitate assessment of ESA-listed rockfish recovery trajectories. From October 2020 to September 2021, staff completed sampling at 73 stations for a total of 170 stations surveyed (Fig. 3). In-field tracking of ESA-listed rockfish encountered indicates that at least 11 yelloweye rockfish were observed on 8 transects. Additionally, at least one Bocaccio was observed on an exploratory transect, although several small rockfish on a single transect appear to be Bocaccio but are awaiting positive confirmation. To date, approximately 50% of the transect videos have been reviewed.





**Figure 3. ROV survey station locations in south Puget Sound for improved abundance estimates of rocky reef associated species including Yelloweye Rockfish and Bocaccio, which are listed under the ESA.**

## Enhanced Yelloweye Recreational Fishery Biological Sampling Project

The goal of the enhanced Yelloweye recreational fishery biological sampling project is to better inform the biological characterization of discarded Yelloweye Rockfish which is deficient due to regulations prohibiting the retention of this species in Washington's recreational fisheries. Twelve recreational vessels participated in the project following the terms and conditions detailed under a federal exempted fishing permit. These vessels were allowed to retain Yelloweye Rockfish incidentally caught in Washington's 2021 coastal recreational fisheries for delivery to the WDFW in port. Vessels were subject to all seasonal, gear, bag limit, or other regulations that applied to the recreational fishery.

Of the participating recreational vessels, four charter vessels and one private vessel encountered and retained Yelloweye Rockfish over multiple trips in Washington's recreational fisheries from April through September of 2021. Charter vessels were responsible for most of the delivered catch from all Washington coastal marine areas. Ninety-seven

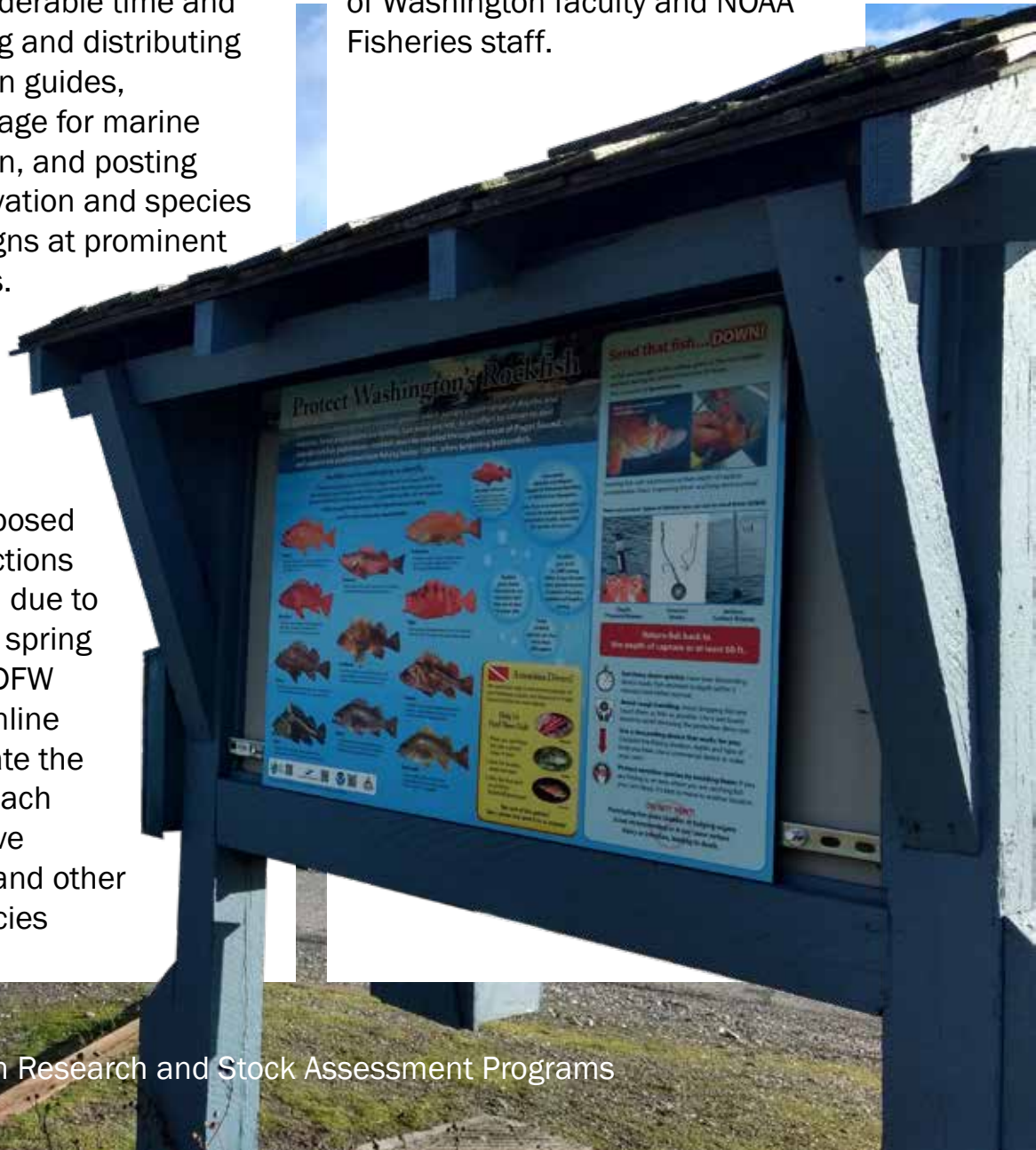
Yelloweye Rockfish were captured and delivered to the WDFW for biological sampling. Length, weight, sex, and age structures were collected on all delivered fish and 93 individuals were assessed macroscopically for maturity in the field and 30 ovary samples were collected for histological maturity analysis to be conducted by the Northwest Fisheries Science Center. Genetic fin clip samples were collected and archived from 96 individuals. Additionally, 95 Yelloweye Rockfish were scanned for internal Passive Integrated Transponder tags to facilitate WDFW tag and release research studies, however, no tags were recovered.

The 97 individuals collected and sampled over the 2021 reporting period significantly increased the available biological information describing Yelloweye Rockfish bycatch from Washington's recreational fisheries. The WDFW continued this project into the second year of the 2021-2022 management cycle to attain the project's sampling goal of biologically detailing 200 individual Yelloweye Rockfish.

## Evaluating Rockfish Education and Outreach Efforts (partial RRA support)

A 2012 research project conducted by the University of Washington clearly demonstrated that the majority of marine fish anglers in Puget Sound struggle to properly identify bottomfish to species group, let alone individual species. In many cases, even ESA-listed rockfish could not be confidently identified. Since 2012, the WDFW has spent considerable time and money designing and distributing fish identification guides, building a webpage for marine fish identification, and posting rockfish conservation and species identification signs at prominent fishing locations. Creation of a survey capable of evaluating education and outreach effort effects was proposed for 2020, but actions were postponed due to Covid-19. In the spring of 2022, the WDFW developed an online survey to evaluate the efficacy of outreach efforts to improve angler rockfish and other marine fish species

identification skills. Results will be used to refine and reevaluate the current outreach and education approaches moving forward. The survey will be distributed to the public in July of 2022 through targeted emails to licensed anglers and promoted via WDFW social media. The results will be analyzed in collaboration with University of Washington faculty and NOAA Fisheries staff.



## Impacts of Covid-19 Pandemic on WDFW Surveys and Data Analysis

In March 2020 the Governor and WDFW imposed strict pandemic response restrictions to the Covid-19 outbreak that limited survey efforts. Data collection efforts impacted by these restrictions for this report included the fall coastal rod and reel index survey, and the summer and fall ROV survey for improved abundance estimates.

The loss of these data cannot be remedied, and long-term data sets used to evaluate rockfish trends will have missing information. However, WDFW staff were safe and effective when sampling re-commenced and were able to adjust to new safety protocols. Cost increases associated with pandemic related safety were significant once sampling was re-instated and the marine fish science unit shifted priorities to ensure rockfish surveys were as comprehensive as possible.



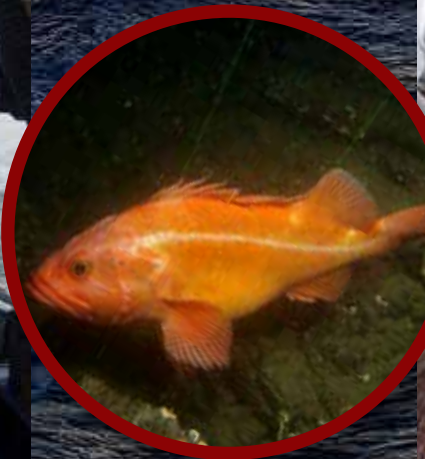
## Research activities proposed from July 2022 to June 2024

From July of 2020 through June of 2022, the WDFW used revenues from the RRA to support new research projects designed to improve the state's research capabilities and management of important, but vulnerable, rockfish species. The RRA also partially supported additional surveys used to inform rockfish assessment and harvest models. In coming years, the WDFW plans to expand on survey efforts and address other pressing needs for data that resource managers can use to make informed decisions. Ongoing and new projects under consideration for the next two-year period are discussed below:

### Ongoing Projects

#### Coastal Yelloweye Rockfish Longline Surveys

The coastal Yelloweye Rockfish longline survey was conducted in the summer of 2021 and 2022 at WDFW-funded rockfish index sites that accompany the annual IPHC longline survey. While the IPHC survey is primarily focused on Pacific Halibut, WDFW rockfish stations are intended to target and characterize Yelloweye Rockfish. Incorporating WDFW rockfish index sites into the IPHC survey allows for the collection of vital fishery-independent information about Yelloweye Rockfish and other rockfish species that inhabit offshore rocky terrain in a cost-effective way. This information will be used to inform the coastal Yelloweye Rockfish stock assessment.



#### Coastal Rockfish Rod-and-Reel Surveys and Covid-19

The coastal rockfish rod-and-reel surveys, as proposed, will continue through 2024. The semi-pelagic survey, focused on Black Rockfish and other schooling rockfish species is planned for the spring of 2023 and 2024, and the demersal bottomfish survey is scheduled in the fall of 2022 and 2023 with no changes to methodology. The fall 2020 survey, focused on bottom-dwelling rockfish and other rocky-habitat associated bottomfish species, was planned but was canceled due to Covid-19. During these surveys, researchers will collect biological samples from rockfish and Lingcod and continue the documentation of habitat types along the coast. Survey data will be used to calculate relative abundance estimates for nearshore rockfish species and to inform the Black Rockfish stock assessment in the 2023 assessment cycle.

### ROV Survey for Improved Abundance Estimates and Covid-19

The Puget Sound-wide ROV survey designed to sample predicted habitats of benthic rockfishes (including ESA-listed Bocaccio and Yelloweye), Lingcod, and Kelp Greenling was narrowed in scope during this reporting period due to a change in survey vessel and the Covid-19 pandemic. In the fall of 2021, the marine fish science unit acquired a new ROV system to replace the outdated system purchased in 2007. Research activities for FY 2023 will primarily focus on operationalizing the new, high-definition capable ROV system and refining ROV survey design and population estimation methods. This process will entail numerous field trials to both test the new system and calibrate system components, such as equipment used to collect rockfish measurements in-situ. Once a survey design is vetted and the new ROV is operational, we plan to

initiate the next Puget Sound-wide ROV survey to collect data that support population estimates for key rockfish species.

### Enhanced Shore-side Sampling of Coastal Recreational Fisheries

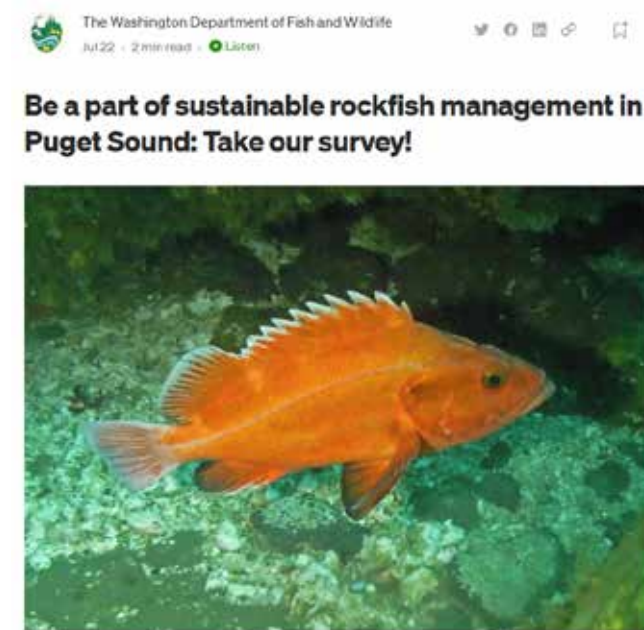
The WDFW's marine fish shore-side sampling program collects biological information on all rockfish species recreationally landed at the ports of Westport, La Push and Neah Bay. Enhanced sampling at these ports is proposed to continue annually from April to September. This program provides valuable biological data such as fish age, length, and weight, which is crucial for rockfish stock assessments. With Covid-19 safety protocols in place, these efforts to ensure that shore-side sampling data collection continues.




### Evaluating Rockfish Education and Outreach Efforts

Evaluation of education and outreach efforts in relation to rockfish will be conducted in 2 phases. The first phase will begin in the summer of 2022, when an online survey developed by WDFW will be initiated. The online survey link will be sent in July 2022 to licensed anglers aged 18 and older who, according to their license type, were able to fish in Puget Sound (saltwater) during the past 5 years. The survey will be open until September 30, 2022. During the survey's open period WDFW communications office will promote the survey via social media, and blog posts, with a reminder being sent to the designated anglers mid-September. In partnership with the University of Washington and NOAA, data from phase 1 will be analyzed to evaluate the present state of angler knowledge with respect to Puget Sound groundfish.


Phase 2 of the evaluation will include in-person angler interviews. The results from this work will be used to evaluate the effectiveness of current outreach and education approaches used by WDFW and will inform future outreach strategies.



### Evaluating the costs of new initiatives:

 **Juvenile Rockfish Biological Data Collection and Surveys:** The WDFW has periodically assessed localized areas for juvenile rockfish abundance and habitat use via SCUBA surveys. With two species of ESA-listed rockfish in Puget Sound, it is important to understand nearshore use, assess juvenile rockfish recruitment events, evaluate juvenile rockfish abundance, and quantify the presence of juvenile rockfish habitat.

In collaboration with NOAA Fisheries, the Seattle Aquarium, the Point Defiance Zoo and Aquarium, the University of Washington, and other partners, the WDFW is evaluating the feasibility of engaging in shallow-water juvenile rockfish surveys. In coming years, the WDFW intends to identify the most cost effective and efficient method of monitoring young of year abundance for rockfish species in Puget Sound, leveraging these key partnerships to achieve shared goals.

 **Conductivity, Temperature and Depth Instrument (CTD) Data Analysis:** During coastal rod-and-reel surveys, researchers used an electronic CTD that measures dissolved oxygen, conductivity (salinity), temperature, and depth. The CTD is deployed at select rod-and-reel stations and measurements are recorded throughout the water column. The information recorded by the CTD can help scientists better understand the chemical and physical parameters of the area they are studying which can lead to a better understanding of species distribution and abundance by area. Currently, this survey data has not been analyzed and the WDFW management is evaluating the cost associated with this analysis.

### General Background Information





## Rockfish Resources

Rockfish is the general term for marine fish species in the family Sebastidae. These fish are typically long-lived, with some species living over 100 years, and occupy a diverse range of depths and habitats. Many species do not reach sexual maturity until well into their teens or twenties. Along the Washington coast, they play a key role in marine ecology. Juvenile rockfish are prey to a variety of species including larger rockfish, salmon, Lingcod, birds, and marine mammals. As they grow, rockfish become generalist predators preying on a diversity of animals from shrimp, to crabs, to fish. On average, rockfish range in size from 1.5 lbs. to 5 lbs. but may reach 30 lbs. depending on species and are a vital link in the marine food web.

Historically, rockfish have been a key component of commercial and recreational fisheries in Washington State. In more recent years, rockfish harvest on the coast and in Puget Sound has been restricted to preserve and recover depleted populations. Because of their long lifecycle and relatively late sexual maturity, rockfish are vulnerable to – and slow to recover from – depletion via overfishing. The situation is exacerbated by contamination from human activities, shifts in global climate regimes, and other stressors that may limit individual survival and/or reproductive output.

## Management Overview

The Pacific Fishery Management Council (PFMC) is the regional council that recommends management measures for the U.S. West Coast to NOAA Fisheries, has jurisdiction over the economic zone off Washington, Oregon, and California, and manages fisheries for about 119 species, including rockfish. Between 1999 and 2007, seven species of rockfish on the

U.S. West Coast were progressively designated as overfished by NOAA Fisheries. As of 2020, only one rockfish species, Yelloweye Rockfish, remains federally designated as overfished off the Washington Coast. The others have been declared rebuilt. The overfished designation for Yelloweye Rockfish has resulted in management action.



**On the Washington Coast, the WDFW management has taken action to:**

- 1.) establish large closed 'Rockfish Conservation Areas'**
- 2.) prohibit recreational retention of Yelloweye Rockfish**
- 3.) require descending devices on vessels targeting all species of bottomfish**
- 4.) limit incidental catch of rockfish by commercial fleets**

Although these restrictions are designed to protect vulnerable rockfish stocks, they also provide positive benefits for other coastal species, including Lingcod, Pacific Halibut, and other bottomfish.

Rockfish harvest restrictions in the Puget Sound currently include area closures and a bottomfish fishing depth restriction of 120 ft. This depth restriction reduces the incidental fishing mortality of rockfish, and in particular ESA-listed Yelloweye Rockfish, when anglers are targeting other bottomfish species. For most rockfish, mortality rates are high even when they are released after capture because rockfish have a gas-filled swim bladder that can over-expand, and even burst, when the fish are brought to the surface, a condition known as barotrauma. While barotrauma also occurs in other fish species, deep-dwelling species, such as many rockfishes, are especially prone to the more dramatic, physically damaging effects (e.g., pop eye, stomach eversion). Extensive public outreach and education initiatives by the WDFW and angling groups have promoted a greater understanding of this issue. Research has shown that releasing rockfish using a descending device allows for recompression of expanded organs and increases survival. In 2017, the WDFW

adopted a new regulation requiring descending devices on all vessels targeting bottomfish in all Puget Sound marine areas, and in 2018 extended this requirement to all coastal areas.

In April 2010, the Puget Sound/Georgia Basin populations of Bocaccio, Canary and Yelloweye Rockfish were listed under the ESA. Since the ruling, collaborative research between the WDFW, NOAA Fisheries, and several local fishing organizations has enabled the removal of the Puget Sound/Georgia Basin Distinct Population Segment (DPS) of Canary Rockfish from the Federal List of Threatened and Endangered Species. Bocaccio continue to be listed as endangered; the only fish species in Puget Sound with this designation, and Yelloweye Rockfish remain listed as threatened.



“While barotrauma also occurs in other fish species, deep-dwelling species such as many rockfishes are especially prone to the more dramatic, physically damaging effects (e.g., pop eye, stomach eversion).”



*Yelloweye waiting to be descended.*



**Within Puget Sound, the WDFW management has taken action to:**

- 1.) prohibit recreational retention of all rockfish (except in the western Strait of Juan de Fuca, which lies outside of the DPS)**
- 2.) restrict fishing depths to shallower than 120 ft. when targeting bottomfish species**
- 3.) require descending devices on vessels targeting all species of bottomfish**
- 4.) eliminate commercial fisheries that target rockfishes**
- 5.) limit incidental catch of rockfish by other commercial gears, in part, by eliminating fisheries.**

# Ongoing Research Supporting Fish Conservation and Management

Scientific research is one of the key components in the effective management of fish species in both state and federal waters. Information drawn from population surveys, catch monitoring programs, and tag recapture studies provide the basis for developing informed stock assessments. Stock assessments are the foundation for both managing fisheries and restoring depleted stocks. The following section describes the long-established research methods, their limitations, and the opportunities for improvement made possible by funding from the RRA.



## Fisheries Monitoring

### Fish-receiving Tickets, Logbooks, and Port Sampling

The WDFW has separate systems for monitoring commercial and recreational fisheries. For commercial activities, the WDFW collects fish-receiving tickets filed by fish processors and trawl logbooks maintained by vessel operators. Submitting the information is a legal requirement. For recreational fisheries, the WDFW conducts angler interviews at dockside or by phone. At ports and ramps, staff collect tag recapture data, biological data, and species composition information at the time of delivery from commercial vessels and from recreational anglers when they conclude fishing. The purpose of these activities is to monitor the catch, encounter rates, and associated mortality of fish – where, when, how, who, and how much.

This information provides the basis for fishery regulations and long-term assessments of harvest trends, although changes in economic and regulatory conditions can limit its value in assessing stock abundance and distribution. This problem is especially apparent in Puget Sound, where directed rockfish fisheries were closed in 2010 to protect depleted rockfish populations and on the coast for species with prohibited retention. Since then, fishery-dependent data in Puget Sound has been limited to reports of rockfish caught incidentally and released in other fisheries, primarily recreational fisheries. This loss of fishery-independent data puts increased reliance on the use of other scientific surveys, and the development of new tools and methods, for assessing rockfish populations.







## Scientific Surveys

Scientific bottom trawl, rod and reel, underwater video, and longline surveys have become the mainstays for collecting detailed information on rockfish and other bottomfish in Washington state. These surveys

provide historical and current population biomass estimates and biological data on the length, weight, sex, maturation stage, genetic status, and age of specimens in Puget Sound and off the coast. These data help to assess the status of fish populations over time.





## Bottom-trawl surveys

The WDFW has conducted scientific bottom-trawl surveys of bottomfish – including rockfish – in Puget Sound on a periodic basis since the mid-1980s. In 2008, the WDFW adopted a standardized survey design that equally samples several depth strata in every sub-basin of Puget Sound from late April to early June each year, providing a consistent index of abundance and distribution. The bottom-trawl protocol is focused on low relief substrates; however, several species of rockfish are frequently encountered and valuable genetic, age, and length data are collected. For the past 10 years, this survey has been one of the primary methods of evaluating stock status and trends for bottomfish in Puget Sound. The 2020 Puget Sound bottom-trawl survey was cancelled due to the Covid-19 pandemic.



In coastal waters, NOAA Fisheries coordinates an annual scientific bottom-trawl survey that samples habitats on the continental slope and shelf from Cape Flattery south to the U.S.-Mexico border. Supported by state fisheries agencies, coastal treaty tribes, and West Coast universities, this survey provides valuable estimates of relative abundance and biological traits of species caught in bottom-trawl gear.

**Bottom-trawl surveys are commonly used for assessing bottomfish on low relief substrates and have limitations specific to rockfish species that include:**

-  **Habitat:** Most bottom-associated rockfish species live in rocky and/or high-relief habitats, which are difficult – if not impossible – to adequately survey using bottom-trawl nets.
-  **Mortality:** Bottom-trawl surveys cause high levels of mortality in sampled fish, including rockfish. When stocks are already depressed, all sources of mortality must be reduced; sampling must be strategic and low impact.

### Coastal Longline Survey

A traditional source of data for coastal rockfish populations has been the annual longline survey conducted by the International Pacific Halibut Commission (IPHC) along the Pacific coast since the early 1960s. While the survey's primary focus is Halibut, it also produces valuable information about rockfish due to overlaps in species distributions. To enhance this survey, the WDFW has funded IPHC survey coverage at additional

sites identified as important Yelloweye Rockfish habitat. This supports the collection of vital data about adult Yelloweye Rockfish and other bottomfish species that inhabit offshore rocky terrain along the coast, providing an index of abundance over time.

Conducting surveys for rockfish using longline gear has two major advantages over the use of bottom-trawl gear. The largest advantage is that it can be used in rocky terrain that is inaccessible to trawling, and secondly, mortality rates for fish caught using longline gear are typically much lower than for those caught in bottom-trawl nets. Most Yelloweye Rockfish caught during the WDFW longline surveys survive being hooked, and are released using a descending device, which counters the effects of barotrauma and enhances survival by returning fish to their naturally inhabited depth. However, like most survey techniques, longline surveys also have their limitations, including a selectivity towards larger fish, lower encounter rates for abundant species due to hook number limits, and fish loss to predation prior to gear recovery.

### Rod and Reel Survey

The WDFW began applying rod and reel methods scientifically as part of a capture-and-recapture (tagging) program in 1981 to monitor Black Rockfish abundance in Washington's coastal waters. In 2010, the Department expanded the Black Rockfish tagging program to include all nearshore bottomfish species and began a series of experimental rod and reel studies designed to assess the diverse groundfish assemblages found in Washington's nearshore coastal waters. The results of these studies led to development of the 2019 coastal index survey methodology which focuses on estimating relative changes in abundance over time. This coastal index survey allows researchers to better monitor the population status

of recreationally targeted rockfish and other bottomfish species. Rod and reel survey methodology allows for selective targeting of individual species through the use of specific, preferred terminal tackle. Using these methods for surveying is comparable to recreational angling and provides fishery independent catch-per-unit-effort (CPUE) estimates. In addition to effort and catch data, rod and reel survey methods allow for the collection of biological data and individual tagging. Rod and reel surveys incur lower mortality rates when compared to bottom-trawl survey methods, and are more effective in sampling rocky, high relief areas, but are limited by angler capacity of the research vessel, and the number or hooks deployed at each survey location.

## Underwater Video Surveys

Since 2007, the Department has employed underwater video technology using a small ROV to conduct abundance and distribution surveys for rockfish and other bottom-dwelling organisms throughout Puget Sound. Given that some species of rockfish show declining trends in abundance and that two species have been ESA-listed in Washington waters, an advantage of the ROV survey is that it does not cause

mortality and is considered a scientifically valid alternative to conventional bottom trawl and longline surveys. The major drawback to visual surveys is the lack of physical fish samples for biological data collection and analysis. However, the recent addition of a stereo camera system to the WDFW's ROV enables the collection of accurate length measurements that can be used for developing size/age-structured population assessments.





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