Washington Department of Fish and Wildlife

report to the

Groundfish Technical Committee

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I. EXECUTIVE SUMMARY

The Washington Department of Fish and Wildlife (WDFW) is organized into three main resource management programs: Fish, Habitat, and Wildlife, with supporting administrative programs. There have been no changes to the executive-level leadership within WDFW in 2024, and the Agency continues to operate under the leadership of Director Kelly Susewind and Deputy Director Amy Windrope. Within the Fish Program, the Fish Management Division oversees research and management of marine fishes, including groundfish. The Marine Fish Science (MFS) Unit within this division, led by Dr. Theresa Tsou, handles Puget Sound groundfish, marine forage fish, and coastal marine fish. Leadership for each of these teams has also remained stable in 2024.

The Puget Sound Groundfish Unit focuses on groundfish research, the management of recreational fisheries for bottomfish under Washington Fish and Wildlife Commission authority, and on the recovery of ESA-listed rockfish in partnership with NOAA Fisheries. The Coastal Marine Fish Science Unit conducts groundfish research, manages coastal groundfish and pelagic species in coordination with the Pacific Fishery Management Council, and conducts commercial and recreational fishery monitoring of groundfish species. State-wide forage fish research and management, and highly migratory species management is conducted by an additional team in the MFS Unit. This group focuses largely on herring and smelt research and monitoring, which is not summarized in this year's groundfish report.

II. SURVEYS AND MONITORING

Puget Sound

A. Puget Sound Bottom Trawl

The WDFW began conducting bottom trawl surveys in 1987 to monitor declining groundfish populations in Puget Sound. The survey design and frequency has changed at several points in time, but a depth-stratified, fixed index station design has been conducted annually since 2008. WDFW contracts a commercial fishing vessel to deploy a scientific trawl net, which is towed for approximately 0.40 nautical miles over 51 index stations throughout Puget Sound. Agency staff conduct the scientific aspects of the survey operation, which includes speciating all catch to the lowest taxonomic level possible, weighing and enumerating all species, and collecting additional biological data according to sampling protocols.

The 2024 bottom trawl survey was conducted in 15 survey days from April 29 - May 23. An estimated 53,291 individual fish belonging to 83 species or taxa and weighing 8.8 mt were

caught during the survey. The total estimated bottomfish biomass and abundance for Puget Sound was 99,294 mt and 544.3 million individuals. Compared to the estimates from the 2023 survey (96,758 mt; 459.6 million individuals), both the biomass and abundance estimates increased, which marks the fourth consecutive survey year that aggregate fish biomass estimates have increased. As in previous years, Spotted Ratfish dominated the catch, constituting 53.2% of the total fish catch by weight and 25.1% of the total number of individual fish, followed by English Sole at 15.6% and 19.8%, respectively. The remaining individual fish species contributed 3% or less to the total fish catch weight and 6% or less to the total number of individual fish (aside from Blackbelly Eelpout at 10% and Pacific Hake at 7%).

For more information on this survey, please contact Jen Blaine (Jennifer.Blaine@dfw.wa.gov).

B. Remotely Operated Vehicle (ROV) Studies of ESA-Listed Rockfish

In November 2024, the Marine Fish Science Unit initiated an ROV survey of the ESA-threatened Yelloweye Rockfish across the U.S. extent of its Distinct Population Segment. The survey consists of a stratified random sampling design, where high- and medium-probability Yelloweye Rockfish habitat, as defined through a species distribution modeling exercise, are specified as the strata. In addition to the video data collected for estimating stratum-specific fish density, the survey collects stereo-camera imagery for determining fish length. Length data will be used to calculate length-based spawning potential ratio, the established recovery metric for ESA-listed Yelloweye Rockfish. This will be the first survey conducted with WDFW's new Seaeye Falcon fiberoptic ROV system, and new stereo-camera calibration hardware and software.

For more information on this survey, please contact Bob Pacunski (Robert.Pacunski@dfw.wa.gov).

C. Puget Sound Recreational Creel Survey

WDFW's Puget Sound Sampling Unit (PSSU) conducts dockside creel surveys at boat ramps and public boat launches throughout the region. They collect information on catch composition and angler Target Type across all waves (i.e., 2-month period) and Marine Catch Areas 5-13 (i.e., interior Puget Sound). The resulting catch and discard rates are used in the production of recreational catch and bycatch estimates for groundfish species in Puget Sound. The PSSU also collects biological information from landed catch, such as lengths and age structures for select groundfish species as possible.

For more information on this survey, please contact Larry LeClair (Larry.LeClair@dfw.wa.gov).

D. Recreational Effort Survey

Ancillary to the Puget Sound Sampling Unit creel survey, effort data has been collected by WDFW from a phone survey of licensed anglers since 2003. Prior to that timeframe, the phone survey was conducted by the Marine Recreational Fisheries Statistical Program at NOAA. During each wave (i.e., 2-month period), a random sample of saltwater recreational fishing license holders are contacted by phone for a brief interview in which information on the number, location, and fishing target species is collected. The information is subsequently used to calculate the mean angler trip rate within that timeframe for each Marine Catch Area and Target Type for that time period. A summary report of the WDFW Puget Sound recreational survey data for groundfish species from 2003-2024 is in preparation and will be completed in 2025.

For more information on this survey, please contact Larry LeClair (Larry.LeClair@dfw.wa.gov).

Coastal

E. Coastal Semi-Pelagic Rockfish Rod-and-Reel Survey

The WDFW has conducted fishery independent rod-and-reel surveys of Washington's coastal groundfish since the 1980s to support periodic stock assessments and other research needs that inform the management and status of marine fish populations. These surveys were amended in 2019 with the implementation of the Semi-Pelagic Rockfish Survey and the Demersal Groundfish Survey (see section G below).

The Semi-Pelagic Rockfish Survey was designed to provide relative abundance indices of Black Rockfish and other nearshore rockfish that typically school above rocky habitat. This annual survey currently includes 162 fixed stations on rocky reefs in nearshore waters (<40 fa) from just outside of Grays Harbor to the confluence of the Sekiu River with the Strait of Juan de Fuca. Each station is fished with standardized gear, effort, and methods. Metadata collected for each drift include effort information, location coordinates, weather conditions, and water column measurements. All catch is identified to species, measured, and externally sexed, and a subset of the catch is selected for age structure collection, genetic fin clip collection, and/or tag-and-release.

All 162 stations were successfully surveyed in 2024 over 21 fishing days from March 14 through April 26. Average drift speeds at each station ranged from 0.1 to 1.0 knots. Total angler rod hours at successfully surveyed stations ranged from 1.7 to 2.3 hours for a coastwide total of 330 rod hours. Groundfish catch included 2,421 individual fish. As expected, Black Rockfish was the most predominant species encountered, comprising 68% of the total groundfish catch of individuals. Other prevalent species included Deacon Rockfish, Yellowtail Rockfish, and Lingcod that accounted for 11%, 10%, and 5% of the catch of groundfish individuals, respectively. All other groundfish species contributed less than 2% to the total catch.

For more information on this survey, please contact Rob Davis (Robert.Davis@dfw.wa.gov).

F. Coastal Demersal Groundfish Rod-and-Reel Survey

The Demersal Groundfish Survey was designed to provide relative abundance indices of groundfish species that are generally found individually or in small groups directly on rocky substrates of the nearshore Washington coast. This annual survey includes 84 fixed stations on rocky reefs in nearshore waters (<50 fa) from just outside of Grays Harbor to the confluence of the Sekiu River with the Strait of Juan de Fuca. Each station is fished with standardized gear, effort, and methods. Metadata collected for each drift include effort information, location coordinates, weather conditions, and water column measurements. All catch is identified to species, measured, and externally sexed, and a subset of the catch is selected for age structure collection, genetic fin clip collection, and/or tag-and-release.

All 84 stations were successfully surveyed in 2024 over 13 fishing days from September 9 through October 10. Average drift speeds at each station ranged from 0.1 to 0.8 knots. Total angler rod hours at successfully surveyed stations ranged from 2.5 to 3.2 hours for a coastwide total of 229.2 rod hours. Fifty-four percent of the 935 individual groundfish caught were demersal species. China Rockfish was the most predominant demersal groundfish species encountered, comprising 25% of the total groundfish catch of individuals. Other prevalent demersal groundfish species ranged in abundance from 3% to 8% of the total catch and included Copper Rockfish, Kelp Greenling, Cabezon, Quillback Rockfish, and Lingcod. Catch rates were noticeably low at stations throughout the central and southern Washington coast where hypoxic oxygen readings were collected.

For more information on this survey, please contact Rob Davis (Robert.Davis@dfw.wa.gov).

G. Rod-and-Reel Deep Water Experimentation

Current WDFW coastal rod-and-reel survey efforts have been limited to waters on the Washington coast less than 40 fathoms deep where nearshore priority species are mostly

distributed; however, some of the groundfish consistently encountered in nearshore surveys have distributions that extend much further off the coast. In 2024, a deep-water experimentation (DWE) survey was conducted on the Washington coast to evaluate the use of rod-and-reel gear at depths over 50 fathoms and to identify specific reef locations at these depths for further study.

The DWE survey was conducted over 550 square miles from the Juan De Fuca Canyon to the Nitinat Canyon and the border of the Canadian Exclusive Economic Zone. Specific fishing locations where Yelloweye Rockfish and other species of interest were known to inhabit were chosen by contracted charter captains. Fishing locations were spaced at least 400 meters apart and ranged in depth from 338 to 1,031 feet. Locations were fished with three individual drifts. Each subsequent drift at each location was fished with a different terminal tackle so that three terminal tackle types could be compared per day. Fishing methods of the current nearshore WDFW rod-and-reel surveys were adjusted for deeper water to reduce the high variance of fishing effort per fishing location and angler caused by extreme depth and catch differences.

Thirty-three individual fishing locations in the study area were sampled over seven charter days in 2024. Forty-seven Yelloweye Rockfish from seventeen locations were encountered. Other predominant groundfish catch included Canary Rockfish, Sablefish, Spiny Dogfish, and Yellowtail Rockfish. Further DWE is warranted to refine an optimal terminal tackle gear and bait type for targeting Yelloweye Rockfish at depths greater than 60 fathoms while maintaining a diversified groundfish catch as well as to sample additional locations.

For more information on this survey, please contact Rob Davis (Robert.Davis@dfw.wa.gov).

H. Ocean Sampling Program for Recreational Fisheries

The Ocean Sampling Program (OSP) is responsible for catch estimation of ocean salmon and groundfish recreational fisheries. OSP uses port-exit counts, primarily, and dockside angler interviews of recreational landings at Ilwaco- Chinook, Westport, La Push, and Neah Bay to track quota attainment for Chinook and Coho Salmon, and to estimate catch of groundfish species. In addition, dockside samplers collect biological and tag data from salmon and length data from groundfish.

For more information on this survey, please contact Kyle Vandegraaf (Kyle.Vandegraaf@dfw.wa.gov).

I. Coastal Sampling Program for Commercial and Recreational Fisheries

The Coastal Marine Fish Science (CMFS) Unit's recreational groundfish sampling program directly supports research and stock assessment by collecting biological data from recreationally caught groundfish species landed at Westport, La Push, and Neah Bay. Comprehensive biological information includes fork length in centimeters, weight in grams, sex information, and age structure collection (otolith or Lingcod dorsal fin ray). This biological information enhances data collection efforts of the WDFW Ocean Sampling Program previously described.

The CMFS unit also collects data on commercial groundfish, coastal pelagic species (CPS), and Hagfish fisheries at all primary coastal ports. The commercial sampling team has two major objectives: (1) to collect biological data – such as sizes, otoliths, and gonads – from commercially landed groundfish to support research and stock assessments; and (2) to collect groundfish catch data via commercial fisheries logbooks, fish receiving tickets, and species composition sampling of mixed-species market categories, which support fisheries monitoring and in-season management decision making.

The CMFS Unit produces periodic reports intended to inform fishery managers and fishery assessment authors by describing the biological and catch data collection methods and including an inventory of data collected. Descriptions of port and fishery dynamics offer context for the changes to data collection methods. Collectively, the series of reports serve to document changes in fishery monitoring and sampling goals, and approaches and procedures in response to evolving fishery management science and management needs. The most recent report, published in June 2020, summarizes activities and accomplishments from 2015 through 2018 (Downs et al. 2020).

Downs, D., K. Hinton, J. Fuller, T. Zepplin, K. Lawson, L. Wargo, T.S. Tsou. 2020. Washington Coastal Commercial Groundfish Fisheries Monitoring Program: Progress Report 2015-2018. Washington Department of Fish and Wildlife. Fish Program Report Number FPA 20-07.

For more information on this program, please contact Rob Davis (Robert.Davis@dfw.wa.gov) for Recreational Fisheries and Donna Downs (Donna.Downs@dfw.wa.gov) for Commercial Fisheries.

III. RESEARCH

A. Groundfish and Benthic Invertebrate 'Vital Sign' Indicators

In 2023, WDFW was awarded a grant from the Puget Sound Partnership to support the development of 'Groundfish and Benthic Invertebrate' Vital Sign indicators to help track

progress towards their recovery goal for 'Thriving Species and Food Webs'. More information on the Puget Sound Vital Signs program can be found here: https://vitalsigns.pugetsoundinfo.wa.gov

Project collaborators hosted a workshop on October 30th, 2024, to gather input from a broad range of scientific perspectives into the indicator development process. Almost 40 participants representing several Tribes, Agencies, and NGOs attended and offered valuable insights into species selection, spatial scale considerations, and in defining key criteria that should be used for identifying single species indicators. As an outcome, Pacific Cod, English Sole, Dungeness Crab, and Spot Prawn were selected as indicator species based on data availability, selectivity by trawl gear, conservation concern, cultural and/or economic importance, and representing different trophic positions in the ecosystem.

A spatio-temporal generalized linear modeling approach was identified as the preferred approach to develop standardized indices of abundance (sdmTMB) using data for these four species. Preliminary indices for two species were developed in 2024, and model-based indices for the selected indicator species will be finalized in 2025. As a secondary objective, we intend to extend this modeling approach to other managed species to develop model-based abundance indices for fishery management needs and stock assessment frameworks. This work is planned for 2025 and 2026.

For more information on this research, please contact Kathryn Meyer (Kathryn.Meyer@dfw.wa.gov).

B. Spiny Dogfish Aging Methods

The most recent stock assessment for Spiny Dogfish (Gertseva et al. 2021) cited several challenges resulting from survey and fishery age data. Dorsal spines are the aging structure used for spiny dogfish and they tend to be brittle and can be worn, creating age reading challenges. To address this area of uncertainty, WDFW began a study to improve ageing information for this species in 2024. Researchers are comparing spine-based age estimates to vertebral growth information through a Bayesian von Bertalanffy model to improve the precision of age estimates and better inform future stock assessments.

Gertseva, V., I.G. Taylor, J.R. Wallace, S.E. Matson. 2021. Status of the Pacific Spiny Dogfish shark resource off the continental U.S. Pacific Coast in 2021. Pacific Fishery Management Council, Portland, OR. Available from http://www.pcouncil.org/groundfish/stock-assessments/

For more information on this research, please contact Lisa Hillier (Lisa.Hillier@dfw.wa.gov).

C. Online Recreational Effort Survey Pilot Study

In Puget Sound, recreational catch for groundfish species is estimated using data from two distinct surveys. A phone-based survey collections information on fishing effort and a dockside creel survey collects information on catch rates for groundfish species, as detailed in the previous section. The resulting effort and creel data are combined to estimate total recreational catch by species, catch area, and wave. Historically, there has been a relatively high degree of uncertainty in the Puget Sound groundfish catch estimates, much of which originates from the high variance in the effort estimates. To improve catch estimate precision, WDFW has initiated a pilot effort survey using a digital (rather than phone-based) format, which will allow the survey to reach a larger number of anglers at less cost. For a one- to two-year period, contingent on funding, WDFW is conducting the phone-based effort and online effort surveys in parallel to evaluate differences. Beginning in 2026, we will begin developing and seeking methodological approval for a correction factor, if needed, in order to retain a continuous time series of angler effort. Initial results are promising and demonstrate a much higher response rate from the online survey relative to the phone survey.

For more information on this research, please contact Kathryn Meyer (Kathryn.Meyer@dfw.wa.gov).

D. Shark Tagging

Broadnose Sevengill sharks (*Notorynchus cepedianus*) are known to occur in the coastal waters of Washington and in the northern Salish Sea. In 2022, a multi-agency collaborative effort verified the presence of adult and sub-adult sharks in South Puget Sound, extending this species' previously known range (Schulte et al. 2024). Since then, researchers have acoustically tagged 15 animals. An array of receivers in Washington, Oregon, and California have detected several of these animals, with a recent detection as far south as Humbolt Bay, CA. Tracking data from tagged sharks helps inform population connectivity throughout the Pacific Ocean, essential habitats for reproduction and feeding, and shark management. Researchers intend to tag an additional 7 sharks in 2025, conduct stomach content analysis for animals in South Puget Sound, and increase the receiver network in the Salish Sea to determine annual migration patterns. Tracking of tagged sharks will occur until 2031.

Schulte, J. M., E.M. Personius, D. Lowry, L. Hillier, A.G. McInturf, and T.K. Chapple. 2024. Advancing the ecological narrative: documentation of Broadnose Sevengill sharks (*Notorynchus cepedianus*) in South Puget Sound, Washington, USA. *Frontiers in Marine Science*, *11*, 1430962.

For more information on this research, please contact Lisa Hillier (Lisa.Hillier@dfw.wa.gov).

E. Historical Groundfish Fishery Compendium and Catch Reconstructions

Understanding and quantifying the historic fishery removals from a stock is essential to generating a time series of these data, which is, in turn, a crucial input to a variety of stock assessment methods and catch- based management approaches. Estimating population-specific removals is exceptionally hard, though, especially for periods with limited record keeping, aggregation of species into market categories, and aggregation of catch by outdated or poorly described geographic area. Sampling protocols, fishery diversity, catch versus landing location, dead discards, and species identification are significant additional complications that vary across time and space, and for which the level of reporting detail can vary widely. Given that many groundfish stocks are distributed coast-wide, and a complete time series of removals is needed, there is a need to coordinate approaches across the states of Washington, Oregon, and California to confront removal reconstruction challenges and establish common practices. Both California and Oregon have attempted historical removal reconstructions and continue making necessary revisions. Washington's first attempt in reconstructing commercial landings for Lingcod and rockfish market categories was completed to support 2017 PFMC groundfish stock assessments. Efforts are continuing to reconstruct flatfish catch histories. At least one report detailing data sources and analytical assumptions, and one report providing details on the history of fishery technology and prosecution, are expected to be completed in the next year. Additionally, significant progress has been made on a report documenting the history of the fishery, fishing technology, and harvest patterns for groundfish in Puget Sound.

For more information on this research, please contact Theresa Tsou (Tien-Shui.Tsou@dfw.wa.gov).

IV. STOCK ASSESSMENTS AND MANAGEMENT BY SPECIES/GROUP

A. Hagfish

The Washington Hagfish Commercial Fishery, which opened in 2005 under developmental regulations, is small in scale, exporting hagfish for both frozen and live-fish food markets in Korea. Hagfish, predominately Pacific Hagfish, are caught in long-lined barrels constructed from olive oil or pickle barrels modified with an entrance tunnel and dewatering holes. Fishing occurs on soft, muddy habitat along the entire outer coast of Washington and northern Oregon. The fishery operates, by rule, only in offshore waters deeper than 50 fathoms and is open access. Licensed Washington fishers can fish federal waters off Oregon and land catch into Washington; however, during the past few years, fleet participation and landings into Washington has been low. The median CPUE is about 4.5 pounds, but instances of high CPUE are not uncommon, as evidenced by reports of "plugged" barrels. Male and female hagfish present similar size distributions, with the largest specimen sampled being a 67-cm female, and

the smallest a 20-cm specimen, sex unknown. An evaluation of maturity suggests year-round spawning, but fecundity is low, with the number of eggs in females at maturity stages 6 & 7 averaging 24 eggs per female.

For more information on this fishery, please contact Donna Downs (Donna.Downs@dfw.wa.gov).

B. Dogfish and other Sharks

Most Elasmobranchs along the coast of Washington are assessed and managed by NOAA and the Pacific Fishery Management Council under the Pacific Coast Groundfish Fishery Management Plan.

Shark species in Puget Sound are not well-monitored by existing surveys, although Spiny Dogfish are observed in both trawl and ROV surveys. Recreationally targeting Sixgill, Sevengill, and Thresher sharks is prohibited statewide, and no directed commercial fishing is allowed for any shark species in Puget Sound. No specific, directed research is being conducted on shark species, other than those described in Sections III-B & D.

C. Skates and Chimeras

Skates along the coast of Washington are assessed and managed by NOAA and the Pacific Fishery Management Council under the Pacific Coast Groundfish Fishery Management Plan.

In Puget Sound, Spotted Ratfish, Longnose Skates, and Big Skates are regularly seen in ROV videos and caught in the Puget Sound bottom trawl survey, where they are counted, weighed, and measured. Sandpaper Skates are less common but occasionally encountered. Spotted Ratfish is the most dominant fish species caught in the trawl survey by both biomass and abundance, with an estimated 51,050 mt and 145 million individuals present in Puget Sound based on the 2024 survey.

D. Pacific Cod

Skates along the coast of Washington are assessed and managed by NOAA and the Pacific Fishery Management Council under the Pacific Coast Groundfish Fishery Management Plan.

In 2023, WDFW engaged in a collaborative research effort with the University of Washington, the Alaska Fisheries Science Center, Department of Fisheries and Oceans Canada, and the Farallon Institute. UW geneticists are leading the study, which focuses on identifying the genetic

underpinnings of Puget Sound Pacific Cod's apparent adaptability to the warmer bottom temperatures of Puget Sound. Work is anticipated to conclude in 2025.

The Puget Sound population of Pacific Cod are also caught in the Puget Sound bottom trawl survey, where they are counted, weighed, and measured; otoliths for age analysis and fin clips for genetic analysis are also taken from a small subset of individuals. In the 2024 trawl survey, 118 Pacific Cod weighing a total of 155 kg were caught compared to 201 individuals and 287 kg in 2023. To improve monitoring of this population, trawl survey data for Pacific Cod are currently being re-evaluated using sdmTMB. A preliminary standardized model-based index shows a pattern of increasing abundance over the past four years, although population levels are believed to be well below historic levels that pre-date trawl survey data collection.

E. Walleye Pollock

Walleye Pollock along the coast of Washington are assessed and managed by NOAA and the Pacific Fishery Management Council under the Pacific Coast Groundfish Fishery Management Plan.

Walleye Pollock are regularly seen in ROV videos and caught in the Puget Sound bottom trawl survey, where they are counted, weighed, and measured. Rough population estimates are produced as part of the survey analysis. Pollock biomass estimates decreased from 3,074 mt in 2023 to 1,633 mt in 2024, and abundance estimates dropped from 64.2 million individuals in 2023 to 26.8 million in 2024.

F. Pacific Whiting (Hake)

Pacific Whiting/Hake along the coast of Washington are assessed and managed by NOAA and the Pacific Fishery Management Council under the Pacific Coast Groundfish Fishery Management Plan.

The Puget Sound Pacific Hake population is primarily monitored with the Puget Sound bottom trawl survey, although they are also observed on ROV surveys. Neither survey type is thought to be the most effective method for monitoring Hake due to their pelagic nature, but the prevalence in the trawl survey data likely provides some indication of population-level trend. Design-based Hake biomass estimates decreased from 1,172 mt in 2023 to 682 mt in 2024, and abundance estimates dropped from 23.7 million individuals to 15.6 million in 2024.

G. Grenadiers

Grenadiers along the coast of Washington are managed as an ecosystem-component species under the Pacific Coast Groundfish Management by NOAA and the PFMC. This species is not thought to occur in Puget Sound.

H. Rockfish

Rockfish species along the coast of Washington are assessed and managed by NOAA and the Pacific Fishery Management Council under the Pacific Coast Groundfish Fishery Management Plan.

In Puget Sound, rockfish are managed in accordance with the policies, strategies, and actions outlined in WDFW's Puget Sound Rockfish Conservation Plan (Bargmann et al. 2011) and the Yelloweye and Bocaccio Recovery Plan (NMFS 2017). All rockfish species have been non-retentive since 2010 in most Puget Sound Marine Catch Areas and a 120-ft "bottomfish exclusion zone" was established in the same year to protect deeper-water rockfish species, particularly ESA-listed Yelloweye and Bocaccio Rockfish. Commercial fisheries targeting groundfish in Puget Sound were also closed in 2010 to promote rockfish recovery. WDFW monitors deep-water rockfish species primarily with periodic ROV surveys, and more nearshore species with periodic dive surveys and other opportunistic sampling methods. See Section II above for more information on these surveys.

A 2023 study, which used length and historical catch data, suggested that Yelloweye Rockfish appear to be on a path towards recovery in Puget Sound, although much uncertainty still exists in the estimates of relative population status (Min et al. 2023). The ROV survey, which is currently underway, is expected to provide an updated estimate of Spawning Potential Ratio as an additional recovery benchmark for this species. ESA-listed (endangered) Bocaccio Rockfish continue to be rare in Puget Sound and have not been identified in an ROV survey since 2015 and in the trawl survey since 2018. Although one Bocaccio was reported in the recreational Salmon fishery in 2024 in South Puget Sound, there was not an opportunity to validate the species identification of this observation.

Bargmann, G., W. Palsson, C. Burley, D. Friedel, and T. Tsou. 2011. Puget Sound Rockfish Conservation Plan (PSRCP) and Final Environmental Impact Statement (FEIS). Washington Department of Fish and Wildlife: Final Environmental Impact Statement for the Puget Sound Rockfish Conservation Plan

Min, M.A., J. Cope, D. Lowry, J. Selleck, D. Tonnes, K. Andrews, R. Pacunski, A. Hennings, and M.D. Scheuerell. 2023. Data-limited fishery assessment methods shed light on the exploitation history and population dynamics of Endangered Species Act-listed Yelloweye Rockfish in Puget Sound, Washington. Marine and Coastal Fisheries 15(5): e210251. https://doi.org/10.1002/mcf2.10251

NMFS. 2017. Rockfish Recovery Plan: Puget Sound/Georgia Basin Yelloweye Rockfish (*Sebastes ruberrimus*) and Bocaccio (*Sebastes paucispinus*). National Marine Fisheries Service, West Coast Region.

I. Thornyheads

Rockfish species along the coast of Washington are assessed and managed by NOAA and the Pacific Fishery Management Council under the Pacific Coast Groundfish Fishery Management Plan.

J. Sablefish

Sablefish along the coast of Washington are assessed and managed by NOAA and the Pacific Fishery Management Council under the Pacific Coast Groundfish Fishery Management Plan.

Puget Sound Sablefish are thought to be an extension of the coastal stock since this species extensively migrates across latitudes and depth gradients and shows very little genetic differentiation across much of its range (Timm et al. 2024). Although no Puget Sound Sablefish samples have been included in prior genetic assessments, they appear to only be abundant when coastal stocks are also highly abundant. Puget Sound Sablefish are monitored with trawl survey data, and although they are infrequently caught, their abundance has been increasing since 2017, with 2024 being the highest observed since the survey began in 1987 (mirroring record-level population estimates along the coast). Recreational catch estimates also show an increase in frequency of Sablefish in recent years. There are no commercial fisheries targeting Sablefish in Puget Sound, and the recreational groundfish fisheries are limited to depths less than 120 ft, which likely also reduces fishing pressure for this relatively deeper-water species. The current fishing regulations are very conservative, and there are no plans to conduct a Puget Sound-specific stock assessment for this species in the near-future.

Timm, L., W.A. Larson, A.J. Jasonowicz, and K.M. Nichols. 2024. Whole genome resequencing of Sablefish at the northern end of their range reveals panmixia and large putative inversions. ICES Journal of Marine Science 0(0): 1-15.

K. Lingcod

Lingcod along the coast of Washington are assessed and managed by NOAA and the Pacific Fishery Management Council under the Pacific Coast Groundfish Fishery Management Plan (PCGFMP).

WDFW samples and processes lingcod fins from both commercial and recreational fisheries, where they are cross-sectioned are aged using the surface-read method. Lingcod age and length data inform coastal age-structured stock assessments and data-limited population monitoring in Puget Sound. The recreational fishery for Lingcod population in Puget Sound is managed by a conservative collection of regulations, which include a short open season time to avoid nesting behavior, a 120-ft depth exclusion, a slot limit, and a daily bag limit of 1 fish. Catch rates in the majority of Puget Sound catch areas have remained relatively stable as a result.

L. Atka Mackerel

No specific, directed research or management to report for Atka Mackerel, which are not thought to occur in Washington waters.

M. Flatfish

Flatfish along the coast of Washington are assessed and managed by NOAA and the Pacific Fishery Management Council under the Pacific Coast Groundfish Fishery Management Plan (PCGFMP).

In Puget Sound, flatfish populations are monitored primarily by the Puget Sound bottom trawl survey. Design-based population estimates are produced for all species of flatfish encountered by the trawl survey, as well as length composition data. Trends for this species complex are relatively stable (i.e. no long-term trend apparent) and are believed to be healthy due to the long-term closure of a directed commercial fishery and very low recreational catch. English Sole is the dominant flatfish species throughout Puget Sound, which has been encountered at all depth strata and regions. The design-based population estimate for English Sole in 2024 was 12,727 mt and 110 million individuals, compared to 9,172 mt and 67 million individuals in 2023.

N. Pacific Halibut & IPHC Activities

WDFW had little to no involvement with IPHC sampling activities in 2024.

O. Other Groundfish Species

No specific, directed research to report for other Groundfish species.

V. RESERVES

There are over 100 marine protected areas (MPAs) in Washington State that fall variously under federal, state, and local jurisdictions. By statute, the WDFW has sanctioned 26 of them. Each has been categorically defined as either a Conservation Area, where harvest of all marine resources is prohibited, or a Preserve, which is less protective and allows for the harvest of some species. All of them are located in Puget Sound and were created between 1970 and 2009.

During the 1990s, the WDFW conducted systematic scuba-based bottomfish censuses over a small number of WDFW Conservation MPAs and nearby habitat-comparable unprotected sites. The surveys showed that the size and abundance of rockfish and lingcod were notably greater in the longest-established MPA (Brackett's Landing Conservation Area) when compared to the unprotected sites. Other pairwise comparisons were less conclusive. No further systematic evaluations of WDFW MPAs have been conducted. Further research is needed to determine whether WDFW-sponsored MPAs are meeting performance expectations, such as improving overall ecosystem health or increasing fish abundance and reproductive output potential.

For more information on WA reserves, please contact Larry LeClair (Larry.LeClair@dfw.wa.gov).

VI. DATA MANAGEMENT

Developing modern databases continues to be a widespread need, particularly in Puget Sound, although progress has been made recently in certain areas. In highlighting progress from 2024, the Puget Sound trawl survey database was migrated from Access to SQLServer, and more efficient workflows are being developed using RMarkdown and GitHub to automate routine reporting. Future data management needs include developing centralized databases for specific survey data which currently exist in flatfile format and migrating older survey data from local files into SQL-Server databases developed for more recent surveys.

VII. UPCOMING WORK, EMERGING NEEDS, CHALLENGES

Over the upcoming 1-2 years, WDFW is focusing on improving the quality and accessibility of Puget Sound fishery data as a foundational step towards producing reliable stock assessments on regular intervals. In 2024, this included developing preliminary model-based indices for select trawl survey species, as described in the Vital Signs Research topic, and establishing a digital recreational fishing effort survey to improve the precision of catch estimates (as described under the Effort Survey Research topic). Next steps will include: 1.) finalizing model-based indices for

trawl survey species, 2.) re-evaluating other aspects of the recreational catch estimation process (e.g. survey stratification), 3.) streamlining data accessibility by centralizing survey and other data sources (as described above) and standardizing QAQC routines, and 4.) identifying research gaps in life history information and ensuring survey biological data collection protocols are aligned with current information needs.

The WDFW ROV program will be assisting with preliminary eDNA research, ultimately focused on developing methods to quantify Yelloweye abundance through eDNA sampling. The project is led by University of Washington in collaboration with NOAA. WDFW will be collecting eDNA samples in tandem with ROV operations in select regions in 2025 and will be incorporating water filtration instrumentation onto the current ROV frame.

VIII. OTHER PUBLICATIONS

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Personius, E.M., J.M Schulte, L. Hillier, D. Lowry, M. English, and T.K. Chapple. 2024. Observation of the critically endangered Soupfin Shark (*Galeorhinus galeus*) in the changing Salish Sea. Frontiers in Marine Science 11: 1420721.

Schulte, J.M., E.M. Personius, D. Lowry, L. Hillier, A.G. McInturf, and T.K. Chapple. 2024. Advancing the ecological narrative: documentation of Broadnose Sevengill sharks (*Notorynchus cepedianus*) in South Puget Sound, Washington, USA. Frontiers in Marine Science 11: 1430962.

Wray, A., E. Petrou, K.M. Nichols, R. Pacunski, L. LeClair, K.S. Andrews, M. Kardos, and L. Hauser. 2024. Contrasting effect of hybridization on genetic differentiation in three rockfish species with similar life history. Evolutionary Applications 17(7): e13749. https://doi.org/10.1111/eva.13749

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