# Washington Contribution to the 2014 Meeting of the Technical Sub-Committee (TSC) of the Canada-US Groundfish Committee

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***Edited by:***
Dayv Lowry

***Contributions by:***
Dayv Lowry
Robert Pacunski
Lorna Wargo
Kurt Stick
Larry LeClair
Corey Niles
Theresa Tsou



**Washington Department of Fish and Wildlife**
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# Review of WDFW Groundfish/Forage Fish Research, Assessment, and Management Activities in 2012

## A. Puget Sound Area Activities

Staff of the Puget Sound Marine Fish Science (MFS) Unit include Dayv Lowry, Robert Pacunski, Larry LeClair, Kurt Stick, Jen Blaine, Adam Lindquist, Jim Beam, Erin Wright, Andrea Hennings, and Lisa Hillier. In addition, Courtney Adkins and Peter Sergeeff work as MFS employees during the spring bottom trawl survey. Taylor Frierson, Casey Wilkinson, and Amanda Philips joined the team in February of 2014 and serve as primary staff for ongoing surveys at U.S. Navy Facilities (see below). Unit tasks are primarily supported by supplemental funds from the Washington State Legislature for the recovery of Puget Sound bottomfish populations, and secondarily by a suite of collaborative external grants. The main activities of the unit include the assessment of bottomfish and forage fish populations in Puget Sound, the evaluation of bottomfish in marine reserves, and the development of conservation plans for species of interest. Groundfish in Puget Sound are managed under the auspices of the Puget Sound Groundfish Management Plan (Palsson, et al. 1998).

1. Puget Sound Groundfish Monitoring, Research, and Assessment (*Contact: Theresa Tsou 360-902-2855, tien-shui.tsou@dfw.wa.gov; Dayv Lowry 360-902-2558, dayv.lowry@dfw.wa.gov)*

**a. ESA-listed Rockfish Critical Habitat Designation**

Working with NOAA staff at the Northwest Fisheries Science Center, in 2013 MFS staff provided data to inform the designation of critical habitat for bocaccio, canary rockfish, and yelloweye rockfish, which were listed under the ESA in 2010. Data provided included occurrences of these three species in all historic and contemporary WDFW research and fishery datasets available. To the extent possible, characterization of the habitat associated with these occurrences was also provided. After the proposed critical habitat designation posted in the Federal Register in October, MFS staff coordinated the Department's critical review of technical documents. In general, the areas proposed for listing were identified using very simple criteria, which appeared to work reasonably well for adults but not for juveniles. MFS staff are currently in negotiations with NOAA to groundtruth the validity of these criteria using visual survey techniques, including SCUBA and remotely operated vehicles (ROVs).

**b. Participation in the Federal Rockfish Technical Recovery Team and Rockfish Working Group**

In late 2012 Lowry and Pacunski were both appointed to NOAA's Rockfish Technical Recovery Team, which has been charged with developing a detailed recovery plan for the three ESA-listed species in Puget Sound and the Strait of Georgia. The RRT met in person four times in 2013 with efforts focused on developing the downlisting and delisting criteria for ESA rockfish. Several presentations were given to the RRT by outside scientists to provide additional information for guiding the RRTs recovery planning efforts. A draft plan is expected to go out for public review by the summer of 2014.

Several members of the Rockfish Technical Recovery Team are also members of a less formal, regional Rockfish Working Group. This group contains members from state and federal government, academia, the aquarium trade, and fishery organization. They meet quarterly to discuss and coordinate regional research activities and share recent technology, research, and outreach developments. In 2013 this group will be formalized as an advisory technical workgroup under the auspices of the Puget Sound

Partnership (PSP). In this incarnation, the workgroup will advise the PSP on issues relating to the monitoring and evaluation of rockfish in Puget Sound with the ultimate goal of "recovering" the Sound by 2020. At present the group is waiting to hold additional meetings until the results of the public review of the ESA Rockfish Recovery Plan are available.

**c. 2010 San Juan Archipelago ROV Survey Report: Stereology**

Based on the success of habitat-stratified ROV surveys conducted in 2008, WDFW returned to the San Juan Islands in 2010 to conduct a survey of all habitat types. The survey design was based on stereology, a technique borrowed from histology and forestry, which systematically surveys locations using a fixed grid with a random starting point. The advantage of this technique is that it allows estimates of fish abundance to be generated for the entirety of the survey area, rather than within a single habitat stratum. The survey grid included 168 stations and also allowed for adaptive stations to be occupied when ESA-listed rockfishes, or high densities of other rockfishes, were observed. A report comparing the results from the 2008, habitat-stratified survey and the 2010, stereology based survey was drafted in late 2012 but, due to departure of the lead statistician for the project as well as competing program and project demands, the final report has been delayed. Redrafting of the report is currently underway and completion is expected by fall of 2014. A presentation was delivered at the Western Groundfish Conference in Victoria, B.C. in February of 2014 by Lowry comparing the results of this study with the results from the habitat-stratified survey of 2008.

**d. 2012 Puget Sound-wide ROV Survey: Stereology**

Building on the results of the 2008 and 2010 surveys in the San Juan Islands, WDFW embarked on a Sound-wide ROV survey based on a stereological design in April of 2012. A fixed grid of points separated by approximately 3 NM was overlaid on Puget Sound, generating 215 survey stations from the Canadian border to the Bonilla-Tatoosh line at the mouth of the Strait of Juan de Fuca, to South Sound. To control for possible diel fish behaviors, the survey was stratified into three time periods; 0000-0759 (morning), 0800-1559 (day), and 1600-2359 (evening). Our goal was to distribute sampling effort equally among periods, however, safety and logistical considerations combined with shorter tidal sequences in the morning and evening hours resulted in a greater proportion of daytime sampling.

The field portion of the survey concluded on April 4$^{th}$, 2013 with a total of 197 stations out of a planned 215 stations sampled. Several stations near Port Angeles and most stations near Point Roberts in the southern Gulf of Georgia were not sampled due to weather and logistical constraints. The final station breakdown by strata was 47 morning (24%), 110 day (56%), and 38 evening (20%). Review of recordings made during the survey is ongoing, with approximately 78% of transect videos having been reviewed at least once. Our current timeline for completion (including second reviews) is May of 2014.

Based on the stations reviewed to date, sand and mud have been the dominant substrates encountered. In contrast, rock and boulder substrates represent only a small portion of the habitat segments viewed. Excluding unidentified small fish, the dominant taxa encountered thus far have been unidentified eelpouts, unidentified flatfish, unidentified gadids, spotted ratfish, blackfin sculpin, and English sole. Few species typically associated with rock or high-relief substrates have been observed. Quillback rockfish are the most common rockfish species seen to date, with this number split almost evenly between hard (boulder/rock/cobble) and soft (sand/mud) bottoms. The only other rockfishes seen thus far include twenty-three Puget Sound rockfish, five copper rockfish, two splitnose rockfish, one greenstriped rockfish, one black rockfish, one brown rockfish, one yelloweye rockfish, one unidentified red rockfish, and 174 unidentified rockfish (many presumed to be a combination of redstripe rockfish

and Puget Sound rockfish). Hexagrammids observed include 96 kelp greenling, 13 lingcod, two whitespotted greenling, and three unidentified hexagrammids.

**e. Continued investigation of the 2006 Recruitment Event of Young-of-the-Year Rockfishes in Puget Sound**

As originally noted in the 2010 report to the TSC, in 2006 an exceptional recruitment of juvenile rockfish was observed by MFS biologists throughout nearly all of Puget Sound. Based on the genetic analyses of post-settlement juveniles sampled in 2006, and length, density, and species composition data acquired from regularly surveyed index sites subsequent to 2006, the recruitment event appears to have been dominated by quillback, copper, and black rockfish. MFS staff hypothesized that the unusually large numbers of sub-adult black rockfish observed in Puget Sound was the result of an influx of juveniles from coastal waters. Due to shifting priorities and lack of available resources, juvenile rockfish index sites were not surveyed in 2012 or 2013 but may be again in 2014.

**f. Bottom Trawl Surveys of Puget Sound**

Since 1987, WDFW has conducted bottom trawl surveys in Puget Sound that have proven invaluable as a fisheries-independent indicator of population abundance for fishes living on unconsolidated habitats. These surveys have been conducted at irregular intervals and at different scales since 1987. Early surveys between 1987 and 1991 were synoptic surveys of the entire Puget Sound, later were stratified, random surveys focusing on individual sub-basins, and in 2008 became synoptic again with stations at fixed index sites.

From April 30$^{th}$ through June 1$^{st}$, 2012, WDFW conducted a bottom trawl survey to assess the abundance of groundfishes in the Puget Sound. This survey was the fifth "Index" survey of Puget Sound, a departure from the stratified-random designs used prior to 2008. This new design is better for assessing changes in the relative abundance of key groundfish species because reoccupying fixed stations will minimize variation in habitat and provide more powerful inter-annual comparisons. The complete "Index" survey design includes 51 stations partitioned among Puget Sound's eight oceanographic basins which include the Eastern and Western Strait of Juan de Fuca, San Juan Archipelago, Strait of Georgia, Whidbey Basin, Central Basin, South Puget Sound, and Hood Canal. Each basin was divided into two geographic subareas (north/south or east/west) except for Central Basin, which includes a third subarea (middle) to better represent this latitudinally elongate basin. We selected previously trawled stations within each subarea from pre-existing depth zones such that one station would be situated between depths of 30 to 120 feet, 120 to 240 feet, 240 to 360 feet, and greater than 360 feet. Depths less than 30 feet are excluded from the survey because they are too shallow for the trawl vessel to operate. Two replicate trawl samples were collected at each stations and were spaced several hundred meters apart to be close to each other but not directly overlapping. The specific objectives of the survey were to estimate the relative abundance, species composition, and biological characteristics of groundfish species at pre-selected, permanent index stations. Key species of interest include Pacific cod, walleye pollock, Pacific whiting, English sole, spiny dogfish, and skates, but all species of fishes and invertebrates will be identified and recorded.

The trawling procedure of the survey was similar to previous WDFW trawl surveys (Palsson et al. 2002, 2003). The 58-foot F/V CHASINA was the chartered sampling vessel, and it was equipped with an agency-owned 400-mesh Eastern bottom trawl fitted with a 1.25 inch codend liner. The net was towed at each station for a distance of 0.40 nautical miles at a speed of 1-3 knots, and the tows lasted

approximately 12 minutes. Net openings ranged from 8 to 14 m depending upon depth and the amount of cable towing the net. The resulting catch was identified to the lowest taxonomic level, weighed and enumerated, and most of the catch was returned to the sea. The density of fish at each station was determined by dividing the catch numbers or weight by the area sampled by the net. Some of the catch was taken for biological samples that were sampled on deck or preserved for laboratory analysis.

During the 19 survey days in 2013 we occupied 42 stations and conducted 84 bottom trawls (Figure 1). Due to concerns for endangered Chinook salmon in 2013, NOAA restricted the survey from operating in the shallowest depth zone (30-120 feet), eliminating nine stations (18 trawls) from the 2013 survey frame. An estimated 70,000 individual fish among 80 species/taxa weighing 14 mt were collected. By weight, spotted ratfish constituted 42% of the catch, followed by English sole at 11%. The next most abundant species were big skate, walleye pollock, Pacific whiting, Pacific sanddab, Pacific cod, spiny dogfish, blackbelly eelpout, starry flounder and longnose skate, which in aggregate accounted for 20% of the catch by weight (1% to 3% per species). Pacific cod were nearly four times more abundant in 2013 than in 2012, accounting for nearly 3% of the total catch. The size distribution of Pacific cod in 2013 was slightly greater than in 2012, measuring from 25 to 78 cm, but the average size of 44 cm in 2013 was 10 cm smaller than in 2012. Similar to 2012, most Pacific cod were distributed in the western Strait of Juan de Fuca, the southern Strait of Georgia and the central basin of Puget Sound, with only a few cod captured in other basins. One ESA-listed yelloweye rockfish was recorded in the catch, weighing 0.7 kg and measured 35 cm in total length. This specimen was dead upon capture thus age structures and genetic samples were collected in accordance with the Section 10 permit for the trawl survey.

**g. Marine Reserve Monitoring: Evaluation of No-Take Refuges for Rocky Habitat Fishes**

Very little reserve monitoring has occurred since 2011 due to changes in program priorities and staffing limitations associated with the 2012-13 ROV survey of Puget Sound. Due to a lack of MSF staff, and commitments to other projects, no monitoring activities were conducted at no-take refuges in 2013. A systematic evaluation of the data collected between 2000 and 2010 has begun and six sites have been identified as having data of sufficient quality and quantity to merit stand-alone evaluations of reserve efficacy. Over the next six months LeClair and Blaine will be drafting a report on this six sites that includes, as an appendix, data from other sites surveyed during the evaluation period for which data collection was more sparse.

**h. Groundfish Surveys at U.S. Navy Facilities**

In the interest of documenting the occurrence of various marine species in the waters within and immediately adjacent to two U.S. Navy facilities on the Kitsap Peninsula, the Navy contracted with WDFW to conduct both ROV-based and hook-and-line sampling of these waters in 2012. The presence of specific species in Navy-controlled waters is of relevance to management of these species under the auspices of the Puget Sound Groundfish Management Plan, Endangered Species Act, and several other policy and management documents. It also has implications for future construction at Naval facilities, especially as it applies to Environmental Impact Statements.

A report detailing the preliminary findings of the surveys at NBK Bremerton and NBK Keyport was accepted by the US Navy in October, 2013. In late 2013 WDFW signed a Cooperative Agreement with the Navy to continue surveys at NBK Bremerton and NBK Keyport, and to initiate new surveys for threatened and endangered (T and E) species at three additional installations; NAS Whidbey Island,

Naval Magazine Indian Island, and Naval Submarine Base – Bangor. These surveys are expected to include scuba diving, ROV, hook-and-line, and acoustic components to establish baseline densities and distributions of T and E fishes at each installation. Funds from the Navy contract were used to hire a supervisory biologist and two technicians to assist with the conducting the surveys and analyzing the collected data. In preparation for these surveys, WDFW purchased a Biosonics DTX scientific echosounder (120 kHz) for conducting the acoustic portion of the project and sent MFS staff Lowry, Pacunski, Blaine, and Lindquist to a three-day training class to learn to use the hardware and software components of the new system.

**i. TSC-sponsored Visual Survey Tools Workshop**

In 2012 the TSC, spurred by suggestions from ADFG's Kristen Green and DFO's Lynne Yamanaka, began planning a coast-wide "hands-on" workshop for management entities utilizing visual survey tools, such as SCUBA, ROVs, AUVs, and drop cameras. WDFW membership on the organizing committee for this event switched from Tsou to Lowry early in the process and numerous organizational meetings were held leading up to the event April 8th and 9th, 2014. A full briefing on the meeting will be provided to the TSC at this meeting but, in short, representatives from 10 agencies/institutes and three NOAA Centers attended the two-day workshop, which focused on planning, designing, and conducting visual surveys as well as video review and data analysis. A proceedings document will be generated in the next few months that contains the results of a pre-workshop survey of participants, detailed discussion points, and project profiles for each group attending the workshop. A shared Dropbox folder was generated as part of the workshop to encourage distribution of grey literature employing visual survey techniques. A mailing list was also generated and discussions are in progress to create a managed list serve, blog, or other communication tool for interested parties to address shared concerns on an ongoing basis.

**j. High-resolution modeling of fish habitat associations, and predictive models**

In collaboration with the SeaDoc Society and Tombolo Laboratories MFS staff are working to integrate high-resolution multibeam bathymetry data from the San Juan Islands with fish occurrence data obtained from ROV and drop camera surveys over five years. H. Gary Greene, a geologist, has spent several years mapping and typing benthic habitats in the San Juans. Leveraging visual survey work conducted by WDFW that overlaps these focal areas, a unique opportunity has arisen to groundtruth Dr. Greene's bottom typing and to use benthic terrain modeler in ArcGIS to evaluate the occurrence of fish species over particular bottom types. Work is currently in the pilot stage, but a cooperative agreement is in development that would see the pilot completed by the end of 2014 and pave the way for a Puget Sound-wide model that could be used to evaluate rockfish critical habitat designations recently made by NOAA.

**k. Derelict gear reporting, response, and removal grant funding**

Marine fish mortality associated with derelict fishing gear has been identified as a threat to diverse species around the world. In Puget Sound, removal of derelict fishing nets has been the focus of a concerted effort by the Northwest Straits Foundations since 2002. In late 2013 the Washington State Legislature granted $3.5 million to the Foundation to "complete" removal of all known legacy fishing nets. A portion of this money was set aside for WDFW to assist with planning of removal efforts and evaluation of the final results.

In 2012 a reporting hotline was developed, and a rapid response and removal team was formed, to prevent the accumulation of additional fishing nets. Because these nets are a direct threat to ESA-listed rockfish, in 2014 WDFW and the Foundation were able to obtain Section 6 funding to continue hotline service and ensure support for the response team. Combined with the legislative grant money mentioned above, this funding source allows the WDFW and Foundation to remove old nets, stay informed about newly lost nets, and remove new nets to minimize/eliminate this threat to rockfish, and the ecosystem at large.

**l. Participation in Conferences and Workshops**

In 2013-14 staff of the Puget Sound MFS Unit presented at, and/or arranged symposia at, several regional scientific meetings, and education/outreach events as indicated below.

Seattle Aquarium Lightning Talk – Discover Science Days, Nov. 6, 2013. Presenter: Robert Pacunski.

WDFW Science Division Annual Meeting, Dec. 9, 2013. Presenter: Dayv Lowry.

Tacoma area Gyro Club monthly meeting, Dec. 10, 2013. Presenter: Dayv Lowry.

Seattle Aquarium Discover Science Days, Nov. 9-10, 2013. Presenters: Dayv Lowry, Robert Pacunski, Jen Blaine, Lisa Hillier, Andrea Hennings.

Marker Buoy Dive Club, Jan. 2, 2014. Presenter: Robert Pacunski.

Western Groundfish Conference, Feb. 10-14, 2014. Presenters: Robert Pacunski and Dayv Lowry with collaborators Jen Blaine and Lisa Hillier.

First Annual Northeast Pacific Shark Symposium, Mar. 22, 2014. Presenter: Dayv Lowry.

TSC Visual Survey Tools Workshop, Apr. 8-9, 2014. Co-organizer: Dayv Lowry. Presenters: Dayv Lowry and Robert Pacunski.

2. Forage Fish Stock Assessment and Research (*Contact: Dayv Lowry 360-95-2558, dayv.lowry@dfw.wa.gov; Kurt Stick (360) 466-4345 ext. 243, kurt.stick@dfw.wa.gov)*

**a. Annual Herring Assessment in Puget Sound**

Annual herring spawning biomass was estimated in Washington in 2013 using spawn deposition surveys. WDFW staff based in the Mill Creek, La Conner, and Port Townsend offices conduct these assessment surveys of all known herring stocks in Washington's inside waters annually. Stock assessment activities for the 2014 spawning season are in progress.

The herring spawning biomass estimate for all Puget Sound stocks combined in 2013 is 7,332 tons (see table below). The cumulative total is a decrease from the 2012 total of 8,517 tons and less than the mean cumulative total for the previous ten year (2003-2012) period of 12,491 tons.

The combined spawning biomass of south/central Puget Sound (including Hood Canal) herring stocks in 2013 of 4,991 tons is a decrease from 2012, when the cumulative spawning biomass for this region was 5,846 tons. Spawning biomass for this region in 2013 was again dominated by the Quilcene Bay and Holmes Harbor stocks. Spawning abundance for these two stocks has been relatively high in recent years. A number of other stocks in the region that historically have been relatively large, are at low levels of abundance, particularly the Port Orchard-Port Madison and Quartermaster Harbor stocks. Spawning activity was again documented in Seattle's Elliot Bay in 2013, a repeat of the initial observation in 2012.

Cumulative biomass of north Puget Sound stocks in 2013, excluding the Cherry Point stock, is similar to recent years. The spawning biomass of the Cherry Point stock in 2013 was a decrease from 2012 and this stock, which is thought to be genetically distinct from other herring stocks in Puget Sound and British Columbia, continues to be at a critically low level of abundance. Estimated herring spawning activity for the Strait of Juan de Fuca region also decreased in 2013, with an estimated spawning biomass of 71 tons.

**PUGET SOUND HERRING SPAWNING BIOMASS ESTIMATES (SHORT TONS) BY STOCK AND REGION, 2004-2013**

| | YEAR | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **2013** | **2012** | **2011** | **2010** | **2009** | **2008** | **2007** | **2006** | **2005** | **2004** |
| Squaxin Pass | 554 | 589 | 565 | 750 | 817 | 1025 | 557 | 755 | 436 | 828 |
| Purdy | 260 | 135 | 711 | 500 | 125 | 496 | | | | |
| Wollochet Bay | 10 | 31 | 21 | 50 | 359 | 45 | 35 | 27 | 67 | 52 |
| Quartermaster Harbor | 157 | 108 | 96 | 143 | 843 | 491 | 441 | 987 | 756 | 727 |
| Elliot Bay | 214 | 290 | | | | | | | | |
| Port Orchard-Port Madison | 184 | 217 | 123 | 350 | 1755 | 1186 | 1589 | 2112 | 1958 | 700 |
| South Hood Canal | 199 | 264 | 156 | 150 | 156 | 223 | 70 | 244 | 210 | 176 |
| Quilcene Bay | 2072 | 2626 | 4443 | 2012 | 3064 | 2531 | 2372 | 2530 | 1125 | 2342 |
| Port Gamble | 273 | 404 | 1464 | 433 | 1064 | 208 | 826 | 774 | 1372 | 1257 |
| Kilisut Harbor | 0 | 0 | 0 | 0 | 0 | 0 | 24 | 54 | 170 | 184 |
| Port Susan | 29 | 61 | 138 | 152 | 251 | 345 | 643 | 321 | 157 | 429 |
| Holmes Harbor | 585 | 678 | 3003 | 673 | 1045 | 686 | 572 | 1297 | 498 | 673 |
| Skagit Bay | 454 | 443 | 469 | 500 | 1027 | 1342 | 1236 | 2826 | 1169 | 1245 |
| **South-Central Puget Sound Total** | 4991 | 5846 | 11189 | 5713 | 10506 | 8578 | 8365 | 11927 | 7918 | 8613 |
| Fidalgo Bay | 100 | 89 | 119 | 103 | 15 | 156 | 159 | 323 | 231 | 339 |
| Samish/Portage Bay | 693 | 430 | 387 | 640 | 320 | 409 | 348 | 412 | 218 | 351 |
| Int. San Juan Is. | 0 | 5 | 0 | 17 | 0 | 60 | 33 | 285 | 41 | 67 |
| N.W. San Juan Is. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Semiahmoo Bay | 569 | 879 | 1605 | 1000 | 990 | 662 | 1124 | 1277 | 870 | 629 |
| Cherry Point | 908 | 1120 | 1301 | 774 | 1341 | 1352 | 2169 | 2216 | 2010 | 1734 |
| **North Puget Sound Total** | 2270 | 2523 | 3412 | 2534 | 2666 | 2639 | 3833 | 4513 | 3370 | 3120 |
| Discovery Bay | 0 | 105 | 0 | 26 | 205 | 248 | 42 | 1325 | 33 | 252 |
| Dungeness/Sequim Bay | 71 | 43 | 104 | 75 | 46 | 69 | 34 | 0 | 0 | 22 |
| **Strait of Juan de Fuca Total** | 71 | 148 | 104 | 101 | 251 | 317 | 76 | 1325 | 33 | 274 |
| **Puget Sound Total** | 7332 | 8517 | 14705 | 8348 | 13423 | 11534 | 12274 | 17765 | 11321 | 12007 |

## b. Unique Herring Spawning and Pending Genetic Research

In late April of 2012 a WDFW field technician (Roy Clark) observed a herring spawning event in Elliot Bay, just offshore from Seattle. The location of this spawning event was unprecedented and the timing matched only one other known spawning population -- the high-profile Cherry Point Stock, which has been previously petitioned for ESA listing. In 2013 the fish returned again, and appeared to occupy a larger area of the Seattle waterfront (though access was limited in 2012 due to tides). A genetic study based on eggs collected in 2012 was complicated by low DNA amplification, but eggs and fin clips were collected in 2013. Analysis of these samples in expected by the end of August 2014.

## c. Herring and smelt population-level genetic studies

Several genetic studies have been conducted on Pacific herring in Puget Sound over the last 20 years. While numerous populations have been sampled, there remain several populations that have never been included in these analyses, as well as a few populations for which poorly resolved genetic relationships still exist. In 2014, Working with the Department of Ecology and the Port Gamble Jamestown S'klallam Tribe, WDFW began collecting fin clips from spawning adults of six populations throughout Puget Sound: Port Gamble, Elliot Bay, Purdy/Henderson Inlet, Cherry Point, Squaxin Island, and Quilcene Bay. Together this suite of populations represents the three known genetically distinct populations of

herring in Puget Sound, several "unresolved" stocks, and two populations that have never been genetically evaluated. The project will continue into 2015 with results expected in June of 2015.

In 2011 the WDFW, in collaboration with the USGS, conducted a preliminary study of surf smelt genetic relationships throughout Puget Sound. The results of this study indicated that a single panmictic stock of this species ranges throughout the Sound and into southern British Columbia. Samples used in this study were eggs, and sample size was low. As an extension of this work, the WDFW has been collecting fin clips from beach seine-caught smelt at eight locations throughout Puget Sound. Funding is currently limited for analysis, but pending legislative money may be used to support completion of this project and support interpretation of the genetic data obtained.

**d. PSEMP's Forage Fish and Food Webs Working Group**

The Puget Sound Ecosystem Monitoring Program (PSEMP) is a multientity consortium that supports several topic-specific standing workgroups. In 2013, PSEMP added a Forage Fish and Food Webs working group, which evolved from a less formal regional forage fish research group that had been hosting seminars and meetings since 2010. As a formalized group, this entity now includes individuals who work not only on forage fish but also the relationships among forage species and other biological components of the Puget Sound ecosystem. In their new advisory capacity to PSEMP the workgroup was able to make several recommendations for the future of forage fish and food web research in Washington state, which were combined with recommendations from other workgroups to develop a strategic scientific work plan for the Puget Sound Partnership.

**e. Puget Sound Institute's Forage Fish Study Panel**

From August 24-29th, 2013 the University of Washington, Tacoma's Puget Sound Institute hosted an inaugural workshop for its Forage Fish Study Panel. This panel is intended to draw on local and regional expertise on forage fish biology and ecology to evaluate existing data gaps and propose novel research approaches that can be instituted given existing resources. The panel will also write collaborative grants to seek support for additional novel work. After hearing two days of testimony from local forage fish scientists and enthusiasts, the Panel considered the available information and developed a list of priority projects to conduct in the next two year. This list was integrated with the Forage Fish and Food Web Working Group recommendations mentioned above to inform the Puget Sound Partnership's science plan, and has also led to several active projects addressing forage fish population dynamics, predation upon forage fish, and the effects of nearshore habitat loss on spawning potential.

**f. Participation in Conferences and Workshops**

In 2013-14 staff of the Puget Sound MFS Unit presented at, and/or arranged symposia at, several regional scientific meetings, and education/outreach events as indicated below.

Puget Sound Institute's Forage Fish Workgroup Kick-off Workshop, Aug. 24-29, 2013. Co-organizer, Presenter, and Panel Member: Dayv Lowry.

Salish Sea Ecosystem Conference, Apr. 30th-May 2nd, 2014. Session co-organizer: Dayv Lowry. Presenter: Dayv Lowry, Adam Lindquist, Kurt Stick.

3. Puget Sound Ecosystem Monitoring Program (PSEMP) *(Contact: Jim West 360-902-2842, James.West@dfw.wa.gov)*

The Washington Department of Fish and Wildlife is a key partner of the Puget Sound Ecosystem Monitoring Program Project (PSEMP), a multi-agency effort to assess the health of Puget Sound. WDFW's "Toxics in Biota" group is staffed by Jim West, Jennifer Lanksbury, Laurie Niewolny, Stefanie Orlaineta, Andrea Carey, and Sandie O'Neill. This group conducts regular status and trends monitoring of toxic contaminants in a wide range of indicator species in Puget Sound, along with evaluations of biota health related to exposure to contaminants. This group has recently conducted additional focus studies on toxic contaminants in Dungeness crab (*Cancer magister*), spot prawn (*Pandalus platyceros*), blue mussels (*Mytilus* spp), as well as a field experiment testing the effects of chemicals leaching from creosote-treated wooden pilings on the health of developing Pacific herring (*Clupea pallasi*) embryos.

## B. Coastal Area Activities

Staff of the Coastal Marine Fish Science (MFS - Coast) Unit includes Lorna Wargo, Brad Speidel, John Pahutski, Bob Le Goff, Brian Walker, Donna Downs, and Vicky Okimura. Seasonal and project staff include Michael Sinclair, Mariko Langness, Colin Jones, and Kristen Hinton. Unit tasks are supported through a combination of state general and federal funds. Long-standing activities of the unit include the assessment of groundfish populations off Washington coast, the monitoring of groundfish commercial landings, and the rockfish tagging project. More recently, unit activity has expanded to include forage fish management and research. The unit is completing a ESA Section 6 funded project to evaluate eulachon smelt bycatch in the Washington pink shrimp trawl fishery and beginning in 2012 undertook a survey of outer coast beaches in an effort to document seasonal and spatial pattern of spawning in surf smelt, night smelt, and sand lance to inform marine spatial planning.

### Activities Related to Pacific Fishery Management and North Pacific Fishery Management Councils

The Department contributes technical support for coastal groundfish and forage fish management via participation on the Groundfish Management Team (GMT), the Coastal Pelagics Management Team (CPSMT), the Scientific and Statistical Committee (SSC), and the Habitat Steering Group (HSG) of the Pacific Fishery Management Council (PFMC). The Department is also represented on the Scientific and Statistical Committee and Groundfish Plan Teams of the North Pacific Fishery Management Council. Landings and fishery management descriptions for PFMC-managed groundfish are summarized annually by the GMT and the CPSMT in the Stock Assessment and Fishery Evaluation (SAFE) document.

1. Coastal Groundfish Management, Monitoring, Research, and Assessment (*Contact: Theresa Tsou 360-902-2855, tien-shui.tsou@dfw.wa.gov; Lorna Wargo (360) 249-1221 Lorna.Wargo@dfw.wa.gov*; *Corey Niles, 360-249-1223, Corey.Niles@dfw.wa.gov), Intergovernmental Resource Management)*

**a. Coastal Rockfish Tagging Project**

In Washington, the first black rockfish tagging project began in 1981. The early tagging work concentrated on gathering biological information, such as movement and growth. Over the intervening years, the project has undergone changes as study objectives were re-defined and improvements in tagging protocols were made. The overall objective of this program has been to produce estimates of black rockfish abundance, growth, survival, and mortality for incorporation into population assessment models. Beginning in 2010, this long-term project was expanded to address some crucial limitations identified by the PFMC stock assessment review panel for black rockfish in 2007 and in a scientific review of the study design conducted in 2008 by Department staff. The limitations included: 1) limited geographic coverage – sample stations were located mid-coast only, 2) tag recovery dependent on fisheries – only recreational charter catches landed at Westport, and 3) narrow focus – only black rockfish. In response, WDFW scientists designed an expanded project to evaluate and correct these limitations. The following objectives were identified:

1. Correct possible bias in current black rockfish tagging project.
2. Extend geographic coverage to include all areas accounted for in the current stock assessment boundaries.
3. Develop simple cost effective long-term fisheries-independent monitoring strategies for black rockfish and other nearshore species.
4. Develop two or more reliable longitudinal rockfish abundance indices.
5. Estimate the growth curve of black rockfish and other tagged fish species from multi-recapture data.
6. Better understand the spatial distribution of nearshore rockfish along the Washington coast.

The expanded project design incorporated numerous changes including broader coverage through capture (and recapture) of *all* rockfish species, not just black rockfish, at fixed locations distributed along the entire Washington coast (Figure 1). Historically, tagging has only been conducted in the spring (March-April); the expanded project added a fall tagging period (September-October). For each sampling period, the target was to capture a minimum of 400 rockfish or to fish a maximum of two days per index station, whichever came first. At each index station, PIT (Passive Integration Transponder) tags were inserted in all rockfish species. In total, the project was expected to tag and capture more than 8000 fish each year. When complete, the expanded survey will comprise three fall and three spring surveys. The first expanded survey was conducted fall, 2010 with the final scheduled for spring 2013 (Table 1).

Tagging trips depart from Westport, La Push and Neah Bay and are conducted onboard recreational charter vessels staffed by captains and deckhands with bottomfish fishing expertise specific to each area. For a typical tagging trip, 10 to 12 volunteer anglers are recruited and tasked with catching rockfish. Tagged fish are recovered as carcasses delivered to Westport from recreational bottomfish charter trips and through recapture during tagging trips.

**Figure 1. Tagging Site Locations**

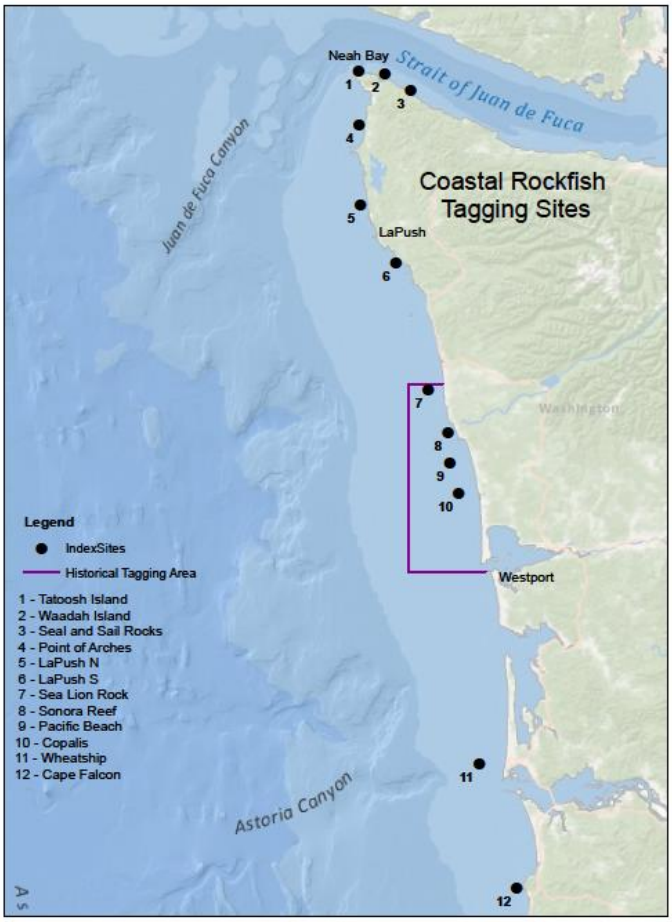


**Table 1. Tagging Statistics**

| | 2011 | | 2012 | | |
|---|---|---|---|---|---|
| Season | Spring | Fall | Spring | Fall | **Totals** |
| Number of Trips | 39 | 20 | 29 | 20 | **108** |
| Total Fish Caught | 6891 | 3227 | 8607 | 4052 | **22777** |
| Total Fish Tagged | 6320 | 3162 | 8297 | 4011 | **21790** |
| Total Fish Released | 6349 | 3196 | 8341 | 4039 | **21925** |
| At Sea Tag Recoveries | 29 | 34 | 44 | 28 | **135** |
| Dockside Sampling | | | | | |
| | 2011 | | 2012 | | **Totals** |
| Fish Sampled Dockside | 37741 | | 40013 | | **77754** |
| Dockside Tag Recoveries | 224 | | 328 | | **552** |

**b. Rockfish Longline Survey**

The Washington Department of Fish and Wildlife (WDFW) has been conducting longline surveys off the northern Washington coast to better understand seasonal changes in catch rates for rockfish that inhabit rocky habitat. Results from these research surveys will be used to improve future survey strategies to monitor and assess rockfish populations, evaluate the risk of localized depletion and survey effects, and to monitor the growth and movement of several important rockfish species.

Using IPHC survey design and data, WDFW has been refining survey strategies more specifically for rockfish that dwell in rocky habitat since 2006. The current survey design with 12 additional stations surrounding IPHC station 1082 ($48^0$ 10' N and $125^0$ 23' W) in waters 50-100 fathoms in depth (Figure 1) was established in 2008. The R/V Pacific Surveyor has been chartered to complete the Yelloweye longline surveys. Due to their experience conducting summer IPHC surveys, the vessel and crew have maintained their gear and methods to IPHC survey standards for our research. Data collected include species composition, biological sampling, tag deployment, and CTD instrument deployment. WDFW biologists conduct 100 percent hook tally sampling for all stations. Biological data from non-rockfish species includes a LF sample of 20 percent of the catch. Catch from the first 20 hooks of each skate are measured. Retained rockfish are sampled for length, sex, weight, and age. Length, sex, tag numbers, and genetic samples are collected from Yelloweye rockfish. Non-rockfish species are released immediately unless they fall within the 20 percent Length Frequency (LF) sampling protocol. Rockfish, other than yelloweye, are retained on ice for biological sampling dockside and donated to a local food bank. Yelloweye rockfish are tagged with an external Floy tag and released at depth with a descending device.

In 2011, the Department began to explore potential seasonal effects on rockfish distributions around IPHC station 1082. Three surveys were completed between October 2011 and October 2012 with eleven, twelve, and nine stations covered respectively (Table 1). All sets deployed during these surveys were deemed to be successful sets. Station 1084 was not set in 2011 due to time constraints and its northernmost location. In October 2012, poor weather throughout the trip reduced fishing time to only three days and only stations 1082 and surrounding TRSS stations were set. A total of 227 yelloweye were successfully released with tags for all trips for an 86% tag rate of individuals encountered (Table 2). Most of the yelloweye encountered are consistently located on the southwest corner of the survey area (TRSS 1531). No tags have been recaptured at present. The total number of fish caught was 1768, 2101 and 1080 for fall 2011, spring 2012 and fall 2012, respectively (Tables 3, 4 and 5). Spiny dogfish comprised the majority of catch across all three surveys. The diversity of species encountered from the fall 2011 survey increased 54% in spring 2012 with number of species caught increasing from 13 to 20. Rockfish species encountered doubled with three species encountered in 2011 and six species in 2012. Total number of fish caught increased 19% and total kilograms caught increased 132%. The percentage of hooks with catch was similar for these surveys with a difference of 4%. The fall 2012 survey saw declines in catch rates and species diversity. Percent of hooks with catch in the fall 2012 was 35.75%, a decrease of 18% and the number of species encountered fell to ten species.

No tags have been recovered from the three surveys conducted in 2011 and 2012. Depending on sufficient yelloweye research set-asides, WDFW anticipates conducting surveys, both spring and fall, over the next several years to tag additional rockfish and to provide the opportunity to encounter previously tagged fish. Initially, WDFW mimicked IPHC survey methods but focused on rockfish stations. In 2012 and going forward, survey methods will diverge somewhat as IPHC conducts bait tests

while WDFW has and will continue to follow the original IPHC protocols for bait. To expand survey interception of smaller rockfish, WDFW intends to test sablefish hooks with squid during surveys in 2013. WDFW has also proposed that the summer IPHC survey include the rockfish stations around Station 1082 to improve seasonal comparisons. (The summer rockfish survey was canceled in 2010 and 2011 due to the low catch limits set by the PFMC and IPHC revising their survey design.)

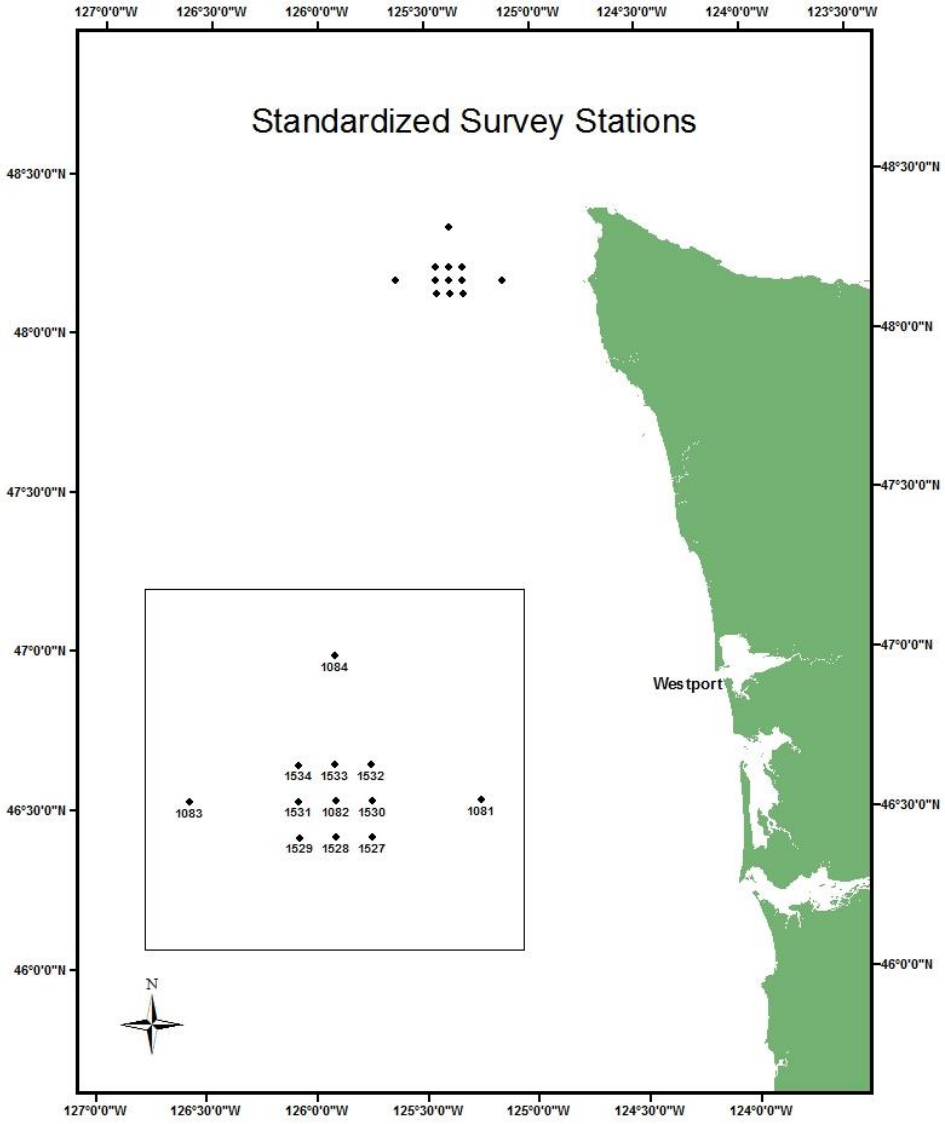


**Figure 1. Standardized Survey Stations**

**Table 1. Trip Summary**

| Trip | Vessel | Survey | Days Fished | Number of Stations Set | Target Stations | Successful Sets |
|---|---|---|---|---|---|---|
| 1 | Pacific Surveyor | October 2011 | 4 | 11 | 12 | 100% |
| 2 | Pacific Surveyor | May 2012 | 4 | 12 | 12 | 100% |
| 3 | Pacific Surveyor | October 2012 | 3 | 9 | 12 | 100% |
| | | **Totals** | **11** | **32** | **36** | |

**Table 2. Yelloweye Tagging Statistics**

| | | | Number Yelloweye Tagged by Station | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Trip** | **Total YE Caught** | **YE Tagged and Released** | **1081** | **1082** | **1084** | **1528** | **1529** | **1530** | **1531** | **1533** | **1534** |
| 1 | 97 | 65 | 1 | 8 | 0 | 12 | 4 | 9 | 14 | 12 | 5 |
| 2 | 110 | 108 | 13 | 9 | 3 | 30 | 2 | 0 | 43 | 4 | 4 |
| 3 | 56 | 54 | 0 | 14 | 0 | 9 | 1 | 0 | 26 | 3 | 1 |
| **Totals** | **263** | **227** | **14** | **31** | **3** | **51** | **7** | **9** | **83** | **19** | **10** |

**Table 3. Fall 2011 Catch Statistics**

| | | | | | | Number Caught by Station | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Species Name** | **Total Caught** | **Average Weight (kg)** | **Total Weight (kg)** | **Percent of Catch by Weight** | **Percent of Catch by Number** | **1081** | **1082** | **1083** | **1527** | **1528** | **1529** | **1530** | **1531** | **1532** | **1533** | **1534** |
| Arrowtooth Flounder | 3 | 1.00 | 3.00 | 0.07% | 0.17% | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |
| Big Skate | 2 | 5.00 | 10.00 | 0.22% | 0.11% | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Canary Rockfish | 9 | 2.43 | 21.87 | 0.48% | 0.51% | 0 | 3 | 0 | 0 | 4 | 1 | 0 | 0 | 0 | 1 | 0 |
| Lingcod | 13 | 9.49 | 123.40 | 2.68% | 0.74% | 2 | 3 | 0 | 0 | 3 | 0 | 3 | 1 | 0 | 0 | 1 |
| Longnose Skate | 11 | 0.09 | 0.98 | 0.02% | 0.62% | 2 | 4 | 0 | 1 | 0 | 2 | 1 | 0 | 0 | 0 | 1 |
| Pacific Halibut | 77 | 7.91 | 609.08 | 13.24% | 4.36% | 19 | 16 | 0 | 0 | 8 | 5 | 7 | 3 | 2 | 15 | 2 |
| Sablefish | 5 | 5.00 | 25.00 | 0.54% | 0.28% | 2 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spiny Dogfish | 1543 | 2.23 | 3443.88 | 74.88% | 87.27% | 201 | 237 | 188 | 125 | 134 | 119 | 100 | 109 | 119 | 92 | 119 |
| Unidentified Sea Cucumber | 1 | 0.10 | 0.10 | 0.00% | 0.06% | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Unidentified Sponge | 1 | 0.10 | 0.10 | 0.00% | 0.06% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Unidentified Starfish | 5 | 0.10 | 0.50 | 0.01% | 0.28% | 1 | 0 | 0 | 1 | 0 | 2 | 1 | 0 | 0 | 0 | 0 |
| Yelloweye Rockfish | 97 | 3.72 | 360.49 | 7.84% | 5.49% | 1 | 11 | 0 | 0 | 21 | 4 | 10 | 23 | 0 | 16 | 11 |
| Yellowtail Rockfish | 1 | 1.00 | 1.00 | 0.02% | 0.06% | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Total Number Caught:* | 1768 | | 4599.39 | 100.00% | 100.00% | 230 | 275 | 190 | 127 | 172 | 133 | 125 | 136 | 121 | 125 | 134 |
| *Number of Hooks:* | 4248 | | | | | | | | | | | | | | | |
| *Percent of Hooks with Catch:* | 41.62% | | | | | | | | | | | | | | | |
| *Number of Sets:* | 11 | | | | | | | | | | | | | | | |
| *Number of Skates:* | 42 | | | | | | | | | | | | | | | |
| *Average Hooks per Skate:* | 101.143 | | | | | | | | | | | | | | | |

## Table 4. Spring 2012 Catch Statistics

| | | | | | | Number Caught by Station | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Species Name** | **Total Caught** | **Average Weight (kg)** | **Total Weight (kg)** | **Percent of Catch by Weight** | **Percent of Catch by Number** | **1081** | **1082** | **1083** | **1084** | **1527** | **1528** | **1529** | **1530** | **1531** | **1532** | **1533** | **1534** |
| Arrowtooth Flounder | 1 | 1.00 | 1.00 | 0.01% | 0.05% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Big Skate | 7 | 20.00 | 140.00 | 1.31% | 0.33% | 2 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Bocaccio | 12 | 3.64 | 43.65 | 0.41% | 0.57% | 0 | 0 | 3 | 0 | 0 | 3 | 0 | 0 | 6 | 0 | 0 | 0 |
| Canary Rockfish | 8 | 2.30 | 18.39 | 0.17% | 0.38% | 0 | 2 | 0 | 0 | 0 | 2 | 0 | 0 | 4 | 0 | 0 | 0 |
| Flathead Sole | 1 | 1.00 | 1.00 | 0.01% | 0.05% | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lingcod | 25 | 7.91 | 197.83 | 1.86% | 1.19% | 5 | 3 | 1 | 0 | 1 | 5 | 5 | 0 | 4 | 0 | 1 | 0 |
| Longnose Skate | 64 | 5.38 | 344.44 | 3.23% | 3.05% | 34 | 6 | 3 | 4 | 7 | 0 | 3 | 1 | 4 | 0 | 0 | 2 |
| Pacific Cod | 1 | 1.00 | 1.00 | 0.01% | 0.05% | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pacific Halibut | 213 | 9.84 | 2096.79 | 19.69% | 10.14% | 40 | 39 | 36 | 15 | 14 | 3 | 15 | 2 | 25 | 0 | 8 | 16 |
| Petrale Sole | 1 | 1.00 | 1.00 | 0.01% | 0.05% | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Redbanded Rockfish | 7 | 2.15 | 15.04 | 0.14% | 0.33% | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sablefish | 4 | 5.00 | 20.00 | 0.19% | 0.19% | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Silvergray Rockfish | 1 | 3.32 | 3.32 | 0.03% | 0.05% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Spiny Dogfish | 1631 | 4.51 | 7353.09 | 69.04% | 77.63% | 64 | 196 | 175 | 233 | 143 | 148 | 108 | 159 | 44 | 174 | 111 | 76 |
| Spotted Ratfish | 3 | 1.00 | 3.00 | 0.03% | 0.14% | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Unidentified Idiotfish | 3 | 1.21 | 3.63 | 0.03% | 0.14% | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Unidentified Sponge | 1 | 0.10 | 0.10 | 0.00% | 0.05% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Unidentified Starfish | 4 | 0.10 | 0.40 | 0.00% | 0.19% | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Yelloweye Rockfish | 110 | 3.61 | 397.48 | 3.73% | 5.24% | 13 | 9 | 0 | 3 | 0 | 31 | 2 | 0 | 43 | 0 | 4 | 5 |
| Yellowtail Rockfish | 4 | 2.32 | 9.30 | 0.09% | 0.19% | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 1 | 0 | 0 | 0 | 0 |
| *Total Number Caught:* | 2101 | | 10650.45 | 100.00% | 100.00% | 173 | 259 | 223 | 257 | 166 | 195 | 133 | 165 | 133 | 174 | 124 | 99 |
| *Number of Hooks:* | 4837 | | | | | | | | | | | | | | | | |
| *Percent of Hooks with Catch:* | 43.44% | | | | | | | | | | | | | | | | |
| *Number of Sets:* | 12 | | | | | | | | | | | | | | | | |
| *Number of Skates:* | 48 | | | | | | | | | | | | | | | | |
| *Average Hooks per Skate:* | 100.77 | | | | | | | | | | | | | | | | |

## Table 5. Fall 2012 Catch Statistics

| | | | | | | Number Caught by Station | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Species Name** | **Total Caught** | **Average Weight (kg)** | **Total Weight (kg)** | **Percent of Catch by Weight** | **Percent of Catch by Number** | **1082** | **1527** | **1528** | **1529** | **1530** | **1531** | **1532** | **1533** | **1534** |
| Canary Rockfish | 11 | 2.38 | 26.15 | 0.81% | 1.02% | 7 | 0 | 0 | 2 | 0 | 2 | 0 | 0 | 0 |
| Lingcod | 6 | 8.28 | 49.66 | 1.53% | 0.56% | 2 | 0 | 1 | 0 | 0 | 3 | 0 | 0 | 0 |
| Longnose Skate | 1 | 1.00 | 1.00 | 0.03% | 0.09% | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pacific Halibut | 30 | 10.00 | 299.96 | 9.27% | 2.78% | 9 | 0 | 6 | 1 | 1 | 3 | 3 | 3 | 4 |
| Rosethorn Rockfish | 1 | 0.44 | 0.44 | 0.01% | 0.09% | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sablefish | 4 | 5.00 | 20.00 | 0.62% | 0.37% | 0 | 1 | 0 | 0 | 3 | 0 | 0 | 0 | 0 |
| Silvergray Rockfish | 1 | 3.99 | 3.99 | 0.12% | 0.09% | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spiny Dogfish | 969 | 2.70 | 2613.68 | 80.77% | 89.72% | 220 | 101 | 101 | 107 | 64 | 98 | 77 | 108 | 93 |
| Spotted Ratfish | 1 | 1.00 | 1.00 | 0.03% | 0.09% | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Yelloweye Rockfish | 56 | 3.93 | 219.96 | 6.80% | 5.19% | 16 | 0 | 9 | 1 | 0 | 26 | 0 | 3 | 1 |
| *Total Number Caught:* | 1080 | | 3235.83 | 100.00% | 100.00% | 256 | 102 | 119 | 111 | 68 | 132 | 80 | 114 | 98 |
| *Number of Hooks:* | 3021 | | | | | | | | | | | | | |
| *Percent of Hooks with Catch:* | 35.75% | | | | | | | | | | | | | |
| *Number of Sets:* | 9 | | | | | | | | | | | | | |
| *Number of Skates:* | 30 | | | | | | | | | | | | | |
| *Average Hooks per Skate:* | 100.7 | | | | | | | | | | | | | |

**c. Outreach and Education**
In support of rockfish identification, and barotrauma and descending device outreach activities, coastal MFS staff expended considerable time and effort to obtain high quality photographs of rockfish, taking advantage of the access afforded through the tagging and 4B rockfish projects. Descending devices were also tested during both projects and photographed in use. These photographs now appear in agency produced barotrauma/descending device posters and brochures and in the 2013-2014 recreational fishery regulation pamphlet. Upgrades to the agency website are underway and these photographs are also being incorporated into the redesigned groundfish id webpage.

2. Forage Fish Management, Monitoring, Research, and Assessment (*Contact: Lorna Wargo (360) 249-1221 Lorna.Wargo@dfw.wa.gov; Dayv Lowry 360-95-2558, dayv.lowry@dfw.wa.gov)*

**d. Washington – Outer Coast Smelt Spawning Beach Survey**

Funded by proviso money from the Washington Legislature to inform marine spatial planning on the outer coast, WDFW staff undertook an 11-month survey (Oct. 2012 to Sep. 2013), of beaches in an effort to document seasonal and spatial patterns of spawning ground usage by surf smelt. Substantial effort has been allocated in identifying forage fish spawning beaches in Puget Sound (over 30,000 surveys in over 30 years) and comparatively little effort on the outer coast (fewer than 100 surveys). Therefore, the distribution and timing of forage fish spawning on the Washington outer coast is incompletely known. This is the first comprehensive forage fish spawning survey of the Washington outer coast done in collaboration with the coastal tribes; Quinault, Hoh, Quileute, and Makah.

Sampling locations included Washington outer coast (Columbia R. North Jetty to Cape Flattery) beaches identified as semi-exposed, cobble-mixed, coarse and exposed sandy beaches based on DNR ShoreZone line feature GIS data. Beaches were then divided into 1000-ft sampling units. Ten percent of potential beach segments were selected for sampling monthly (84 segments/month), without replacement, for each month. The plan was to utilize the obtained data to develop an occupancy model, allowing extrapolation of spatiotemporal patterns to the remainder of the sampling universe. Insufficient detections of eggs occurred, however, and an additional year of survey effort is needed before this model can be fully parameterized. Fieldwork for the second season of this study is ongoing.

A report was published in the WDFW Technical Report series coving the first year of sampling:.

Langness M., P. Dionne, E. Dilworth, and D. Lowry. 2014. Summary of coastal intertidal forage fish spawning surveys: October 2012 – September 2013. Washington Department of Fish and Wildlife, Fish Program Report Number FPA 14-01.

**f. Washington Commercial Shrimp Trawl Observer Program – Eulachon Bycatch Study** (*Contact: Lorna Wargo (360) 249-1221 Lorna.Wargo@dfw.wa.gov)*

The ocean pink shrimp (*Pandalus jordani*) trawl fishery is a vital component of Washington's coastal commercial fisheries, providing greater stability compared to other trawl fisheries. In 2010, eulachon were listed under the ESA as a threatened species. In that listing, the Pacific Northwest trawl fishery for ocean pink shrimp was deemed a moderate threat to eulachon recovery; the Eulachon Biological Review Team (BRT) ranked bycatch second among the severity of threats impacting recovery of eulachon

stocks (Gustafson, et. al., 2010). The ocean pink shrimp fishery also encounters rockfish including "overfished" species, e.g. dark blotched rockfish *Sebastes crameri* and Pacific ocean perch *S. alutus* juveniles and yelloweye rockfish S. *ruberrimus*. Prior to 2010 very limited information about bycatch composition or rates existed for the Washington shrimp trawl fishery. To close this data gap, the Washington Department of Fish and Wildlife undertook two actions: 1) implemented regulations effective in 2010 to require participation of Washington licensed shrimp trawl fishers in the West Coast Groundfish Observer Program (WCGOP); and 2) sought and received a Species Recovery Grant to implement a state-based observer program (Studies of Eulachon Smelt in Oregon and Washington, NOAA Grant No.NA1ONMF4720038. This project concludes June 30, 2013; a final report is due December 31, 2013.

MFS-coastal unit staff conducted the state-based program, deploying observers on vessels during the 2011 and 2012 shrimp fishery seasons with simultaneous coverage by the WCGOP. In 2011, the WDFW observer program observed 819 tows (23.7%) across 50 trips (24.3%). Section 6 funding cuts reduced coverage in 2012 to 666 tows (15.9%) across 41 trips (16.1%). Sampling protocols largely followed the WCGOP and estimates of bycatch for eulachon smelt, plus other species or categories of fish will be reported. While the study had enumeration of bycatch and collection of eulachon biological data (including genetic sampling) as its primary objectives, formal and informal actions to reduce bycatch were also undertaken. Regulatory changes to allow only rigid panel excluders and to reduce the maximum bar spacing on excluder panels (or biological reduction device; BRDs) to ¾ inches were adopted and effective for the 2012 season. Staff encouraged voluntary gear and fishing practice changes by skippers to reduce bycatch, and deployed underwater camera equipment to collect video to further inform and guide these changes.