Assessing alternate estimation methodologies and potential bias in recreational halibut and marine fish fisheries occurring in Puget Sound Washington

FY 2016 Proposal

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1. Overview

1.1. Sponsor
Steve Williams

1.2. Focus Group
Survey Design and Evaluation

1.3. Background
The Washington Department of Fish and Wildlife (WDFW) is mandated to preserve and protect Washington's fish resources and maximize recreational fishing opportunities within resource protection needs. Fish management is very complex due to a number of factors including: a continually growing human population; fulfilling the fishing rights of the Northwest Treaty Tribes; increased recreational demands for fish harvest, and the ability to address the requirements of the Endangered Species Act.Currently, catch and effort in the Puget Sound recreational halibut and marine fish fisheries are estimated using a compound survey, with creel surveys to estimate catch per angler trip, and phone surveys to estimate total effort. However, because estimates are not available until after the season has ended, this method does not allow fishery managers to manage these fisheries during the season. Because of this management structure, recreational seasons (specifically for halibut) have set season opening and ending dates that do not allow for in-season adjustment to account for changes in fishing effort or severe weather. In recent years, this has led to halibut catch that is in excess of Puget Sound area quotas. In the past, seasons were set too short to achieve harvest goals. A secondary method is also used to estimate total catch involving a Catch Record Card system in which anglers are required to record their catch on a pre-printed card and return it to WDFW annually at the end of March. Estimates are generally available one to one and one-half years after the close of the fishery but do not currently include estimates of bias associated with anglers that do not return their catch record cards.

1.4. Project Description
The WDFW is proposing to intensively monitor the recreational halibut and marine fish fisheries occurring in Marine Area 9 of Washington's Puget Sound using an aerial-access design that is currently used by WDFW during winter Chinook mark-selective fisheries. This methodology consists of aerial-access surveys and dockside sampling. The aerial access design is the most suitable design for surveying large geographic areas, such as Marine Area 9, which includes numerous public and private access points. This methodology allows WDFW to assess proportions of angler effort originating from sites both within and outside our sample frame.

The WDFW is proposing this project with the goal of providing precise, in-season estimates of catch and effort for halibut and marine fish. The WDFW will also examine these estimates against current methodologies for any bias that could be occurring in the current methodology, and also examine the effort data gathered in the time period to better inform the current weighting approach that was addressed in a previous MRIP review of sampling programs. If approved, this project would align with other funding and studies currently planned for implementation in Marine Areas 5, 6, and 7 during the recreational halibut and marine fish seasons in May and June of 2016. The same design will be employed in Marine Areas 6 and 7, thus providing consistency in estimation methods across areas. The WDFW will monitor the recreational halibut fishery in Marine Area 5 using the methodology currently used in the WDFW Ocean Sampling Program for Marine Areas 1 through 4. This method is appropriate when all or most of the effort accesses the fishery from few sites, and consists of boat entrance/exit counts and dockside sampling. These marine areas were chosen for intensive monitoring due to regulations for halibut retention during the time period.

The proposed project will allow WDFW to evaluate an alternative survey design for monitoring these fisheries during the May andJune time period. Fishery managers will have the benefit of having timely estimates of catch and effort, and an alternative estimate to compare the current estimation schemes for any bias that may be occurring. The effort data will also be used to inform site effort weighting that is used in the current estimation method. This could improve the accuracy and precision of future estimates. An additional benefit for fishery managers will be a better understanding of spatial distributions of effort, providing for more
informed decision making.

1.5. Public Description

1.6. Objectives
• Collect recreational halibut and marine fish catch and effort data in Washington's Marine Area 9 in the months of May and June in order to estimate total angler effort and catch in season.
• Examine in-season estimates of catch and effort for halibut and marine fish to current methods used to produce RecFin estimates during this time period for any potential bias in the current methodology.
• Use effort data to inform improvements in site weighting that was addressed in a previous MRIP review of WDFW Puget Sound Sampling program.

• When necessary, use halibut harvest data to inform in-season management.

1.7. References

Cochran, W.G. 1977. Sampling Techniques (third edition). John Wiley and Sons. New York.
Johnson, N., S. Kotz, and N. Balakrishnan. 1994. Continuous univariate distributions. Volume 1.
John Wiley & Sons, NY, 2nd edition.
Murthy, M.N. 1957. Ordered and unordered estimators in sampling without replacement.
Sankhya 18:379-390.
Volstad, J.H., K.H. Pollock, and W.A. Richkus. 2006. Comparing and combining effort and catch estimates from aerial-access designs as applied to a large-scale angler survey in the Delaware River. North American Journal of Fisheries Management 26:727-741.

2. Methodology

2.1. Methodology

The WDFW will apply an aerial access design to monitor the Marine Area 9 halibut and marine fish fisheries occurring in May and June of
2016. We determined that the aerial-access approach was the most suitable design for surveying large geographic areas such as Marine Area 9 during this time period. The aerial-access design incorporates aerial survey-based total effort counts rather than on- the-water surveys (i.e., as implemented for the Murthy estimator method; Murthy 1957, Cochran 1977) to assess proportions of angler effort originating from access sites in the fishery, including the sites in our sample frame as well as those outside of our frame.

The WDFW will collect data on total catch (observed harvest and reported releases) and total angling effort using an aerial–access design (e.g., Volstad et al. 2006) whereby: 1) catch and effort data are obtained by interviewing all anglers departing the fishery at four access sites that were staffed on randomly selected sample days (within Monday-Thursday and Friday-Sunday strata); 2) the fraction of total fishing effort contained in our sample frame is estimated from paired peak activity counts (i.e., boats) for sample frame sites and peak aerial boat counts (i.e., for all of Marine Area 9) on days when both dockside sampling and aerial surveys were possible, and 3) total catch and effort estimates are obtained for all sample days by expanding sample-frame observations by the estimated sample fraction.

We collect data on total catch and total angling effort using a two-stage stratified sample design. At the first stage, we randomly select sample days each week from two temporal strata -- weekday (Monday-Thursday) and weekend (Friday-Sunday) periods. To achieve a reduced frequency (while still producing in-season biweekly creel estimates, albeit with reduced precision), we randomly select n=2 out of N=8 possible weekday stratum days (Monday-Thursday) for sampling in each two-week interval. We also randomly select n=2 out of N=3 possible weekend stratum days (Friday-Sunday) each week for sampling. Also, given that days when halibut retention is allowed behave differently than non-halibut days, we will sample all halibut days within the 2 month fishery. (The number of days in Marine Area 9 where halibut retention was allowed in 2015 was 11.)

On selected sample days, we staff access sites in our sample frame (i.e., public ramps, boathouses, etc.) for creel sampling. In Marine Area 9, our dockside sample frame includes four moderate-to-high effort, public boat launch facilities used to access the area (these are fixed sites throughout the season for the aerial-access design):Port Townsend Boat Haven Ramp, Fort Casey/Keystone Ramp, Everett Ramp and Kingston Ramp.

In contrast to the approach we have used in other marine areas (i.e., n = 2 sites are randomly [non-uniform probabilities based on-the-water interviews] chosen from a sample frame), for the aerial-access design we staff all four sites in each area on scheduled sample days. We visit all sample sites on scheduled sample days so that we can maximize our sample size and minimize the degree of expansion required to obtain fishery-wide estimates of catch, effort, and angler-reported releases. Finally, given that some effort is excluded from our sample frame (i.e., private and/or low-effort access sites), we estimate sample frame coverage from aerial overflight data and account for this quantity in estimates of fishery- wide totals.

At access sites selected for sampling on scheduled sample days, samplers interview all parties (from both fishing and non-fishing vessels) exiting the Marine Area 9 fisheries. During interviews, samplers acquire data on trip duration (time of start, time of finish), trip intent (i.e., targeted species), area fished, and fish encountered (kept and/or released, by species).
Due to the vast size and complex geography of Marine Area 9, we use an aerial overflight approach in each area to estimate total fishery effort and thus the proportion of effort captured in the four-site sample frame in each area (i.e., the sample fraction [f = 1
– the out-of-frame effort proportion]). Surveys will be conducted on a subset (n = a minimum target of approximately 5 per month) of scheduled (i.e., dockside) sample days and are timed to coincide with the assumed period of peak activity for these fisheries (1000-1500). Trained WDFW staff conduct the surveys from fixed-wing aircraft piloted by WDFW-enforcement or chartered personnel. The total number of flights will be determined when halibut seasons are set in early 2016, but will be stratified to occur on weekdays, weekends, halibut retention and non-retention days. Eighteen flights are planned for the

2-month period.

For each aerial survey, samplers (aerial observers) circumnavigate the entirety of Marine Area 9, counting all recreational vessels observed while marking them on a map form. Aerial observers make no attempt to distinguish recreational boats as being either fishing or non-fishing vessels; however, obvious non-fishing vessels such as sail boats, commercial crabbing vessels, etc., are noted as such on forms and omitted from final counts. Observers will also include notations about vessels either stationary (fishing) or running.

For each flight, we estimate the sample fraction, f, by pairing the aerial total boat count with the sample-frame total for boats active during the flight period (i.e., determined from interview details). We then obtain stratum-specific estimates of the mean sample fraction (and its variance) and use these values to obtain stratum- and fishery-total estimates of angling effort and landed catch. The estimators (totals and variances) associated with this complemented aerial–access approach are provided on the WDFW website (http://wdfw.wa.gov/publications/01357/ Appendix C).

For the aerial-access design to yield unbiased estimates of catch and effort, a number of assumptions must be met. First, key assumptions for this design that are similar to the Murthy design (Murthy 1957, Cochran 1977) include:
• Catch per unit of effort (e.g., retained catch per angler trip) does not differ between sites in the sample frame and those sites outside of the sample frame.
• All anglers are interviewed and accurately report catch and encounters.

Second, by adding the aerial–access based sampling fraction to our calculations, we also assumed the following:
• The relative proportion of effort originating from sites within and outside of our sample frame does not differ between fair weather (i.e., when flight is possible) and poor weather days (i.e., when aerial surveys cannot be conducted).
• All boats that are actively fishing are accurately counted (e.g., boats are neither missed nor double counted).
• Boat ingress and egress rates are equal.
• Anglers accurately report their periods of fishing activity.
• The relative proportion of effort originating sites in our sample frame and out-of-frame sites does not differ between weekday and weekend days.

2.2. Region
Pacific

2.3. Geographic Coverage
The geographic area of study would be Washington State’s Marine Area 9.

2.4. Temporal Coverage
May - June 2016

2.5. Frequency
Sampling will occur in May and June of 2016

2.6. Unit of Analysis
Vessel based survey (private and charter vessels)

2.7. Collection Mode
Intercept

3. Communication

3.1. Internal Communication
Team members will communicate in person and via email starting in early February 2016. Once the project is implemented, team members and the team leader will communicate no less than weekly regarding logistics and fishery behavior. The primary mechanism for communication will be phone calls with the secondary being emails. Catch estimates will be communicated to team members and other interested WDFW entities as they are available through email.

3.2. External Communication
There are no formalized plans currently for communicating project results to interested stakeholders and constituents. The team leader and appropriate policy representatives will make that determination prior to project inmplementation.

4. Assumptions/Constraints

4.1. New Data Collection
Y

4.2. Is funding needed for this project?
Y

4.3. Funding Vehicle
Pacific RecFIN grant

4.4. Data Resources
No data is required from NOAA. All data will be collected by the WDFW Puget Sound Sampling Program.

4.5. Other Resources
Additional WDFW samplers will be needed to be hired and trained. More time from existing WDFW staff will also be used for sampler supervision, data entry, error checking, data analysis, catch estimation, and report writing.

4.6. Regulations
No regulatory changes are required.

4.7. Other

5. Final Deliverables

5.1. Additional Reports
In-season estimates of catch and effort can be provided to RecFIN.

5.2. New Data Set(s)
None

5.3. New System(s)
None

6. Project Leadership

6.1. Project Leader and Members

First Name	Last Name	Title	Role	Organization	Email	Phone 1	Phone 2
Mark	Baltzell	Fish and Wildlife Biologist 4	Team Leader	Washington Dept of Fish and Wildlife	mark.baltzell@dfw.wa.gov	3609022807	
Tyler	Garber	Electronic data systems support	Team Member	Washington Dept of Fish and Wildlife	tyler.garber@dfw.wa.gov	360-902-2830	
Karen	Kloempken	Data manager	Team Member	Washington Dept of Fish and Wildlife	karen.kloempken@dfw.wa.gov	360-870-1094	
Heather	Reed	DO MARNE FSH/COAS TAL SHELLFISH POL COOR, Director's Office	Team Member	Washington Dept of Fish and Wildlife	heather.reed@dfw.wa.gov	360-249-4628 ex 1202	

First Name	Last Name	Title	Role	Organization	Email	Phone 1	Phone 2
Patrick	Simpson	Sampling Supervisor	Team Member	Washington Dept of Fish and Wildlife	patrick.simpson@dfw.wa.gov	425-672-9283	

7. Project Estimates

7.1. Project Schedule

Task #	Schedule Description	Prerequisite	Schedule Start Date	Schedule Finish Date	Milestone
1	Hire and train sampling staff		04/16/2016	04/30/2016	
2	Sample recreational fishery in Marine Area 9.	1	05/01/2016	06/30/2016	
3	Analysis and final report.	2	09/01/2016	01/31/2017	

7.2. Cost Estimates

Cost Name	Cost Description	Cost Amount	Date Needed
Salaries	6 Additional Sampling Staff	$37002.00	04/30/2016
Benefits	Benefits for 6 additional sampling staff	$10254.00	04/30/2016
Goods and Services	Equipment and personnel costs	$2247.00	04/30/2016
Goods and Services	Flight costs.18 flights @ $1150 per flight.	$20700.00	04/30/2016
WDFW indirect costs	WDFW Negotiaited indirect rate @ 29.21%	$20682.00	04/30/2016
Travel	projected travel costs to sampling locations	$600.00	04/30/2016
TOTAL COST		$91485.00	

8. Risk

8.1. Project Risk

Risk Description	Risk Impact	Risk Probability	Risk Mitigation Approach
Inability to hire enough temporary staff to full fill sampling obligations.	The inability to hire enough staff would put a strain on existing permanent staff. Other sampling occuring in that time period may have to be curtailed to make the project successful.	Medium	Could possibly draw permanent staff from other areas or work units. Have the ability to reassign permanent staff in work-group. This could lead to increased costs.

Risk Description	Risk Impact	Risk Probability	Risk Mitigation Approach
Halibut fishing could be closed for 2016	This would be a low impact risk. Project could still be successful in sampling other marine fish catch during the time period.	Low	This would result in a need for less flights and reduced project costs.

9. Supporting Documents