

***Internet Recreational Effort and Catch (iREC) survey 2016:
report to Pacific Salmon Commissions Northern Fund.***



David O'Brien¹ & Rob Houtman²

¹ South Coast Area
3225 Stephenson Pt. Rd,
Nanaimo, BC V9T 1K3

² Pacific Biological Station
3190 Hammond Bay Rd,
Nanaimo, BC V9T 6N7

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Executive Summary

In the 2016/2017 recreational licence year – which lasts from April 2016 until March 2017 – Fisheries and Oceans Canada partnered with the Pacific Salmon Commission's Northern Fund to operate and improve the departments' internet recreational effort and catch (iREC) survey. The survey is a web-based survey of recreational licence holders each month to collect data allowing estimation of complete effort and catch information for all times, areas, recreational fishing methods and species for Pacific Region tidal waters. The survey operated without issue monthly through the licence year (February and March iREC surveys are just finished or in progress at the time of writing). To date (excluding the February and March surveys) 90,980 licence holders were invited to complete the survey and 30,359 (33.4%) have done so. These responses have been analysed to produce raw iREC estimates of effort and catch at this time, and relative catch rates by Pacific Fishery Management Area (PFMA) and month are presented for selected salmon species in the report. Further analysis to bias-correct these raw iREC estimates with the results of the 2016/17 creel survey are underway and will be completed by May. Bias-corrected iREC estimates will be made available then. Beyond operation and estimate provision, this project focused on improvements to the survey interface and analytical methods. The methods to identify fishing location in the survey were improved with improvements to the map based selection tool and updates to the instructional video for the survey to reflect those changes. Work on bias-correction methods and alternative approaches to combine creel and iREC estimates are also underway as a result of this project.

Introduction

In August 2015, Fisheries and Oceans Canada applied to the Pacific Salmon Commission (PSC) for funding to support operation and continued development and improvement of the Internet Recreational Effort and Catch (iREC) Survey under the 2016 Northern Fund. This project report summarizes the activities and outcomes obtained under that funding. The project is one facet of implementing the regional Strategic Framework for Catch Monitoring and Fishery Reporting (DFO 2012) which identifies the need for improved catch estimation across all fisheries.

A significant proportion of the catch of chinook (*Oncorhynchus tshawytscha*) and coho (*O. kisutch*) in BC is taken from recreational fisheries. For example, in southern BC the retained catch in recreational fisheries has averaged 160,000 chinook and 97,000 coho from 2010-2014. Total encounters (retained plus released) have exceeded 300,000 chinook and 160,000 coho annually in recreational fisheries.

Improved accuracy in catch estimates is increasing in importance in the management of chinook and coho salmon under the implementation of the PST. For example, millions have been spent through the sentinel stock program to improve the accuracy and precision of escapement estimates. This low cost project can significantly improve the accuracy of annual recreational catch estimates.

For over 30 years, creel surveys were the only method used to estimate recreational fishery catch and effort in British Columbia. Although creel surveys cover peak periods and areas, for the majority of month-area combinations there are no catch monitoring programs and thus no catch estimates. The

extent of these coverage gaps have varied with funding level for creel survey coverage. The estimation of catch and effort in these gaps is the ultimate goal of this ongoing project.

iREC Survey

After a review of different methods, Canada developed an internet / email based survey of all recreational fishing licence holders as a means of monitoring all recreational fishery strata in BC marine waters at low cost. This survey is called the “internet recreational effort and catch” (iREC) survey. The iREC survey requires a portion of licence holders provide a simple log of fishing activity and catch for a one month period. These reports are expanded to all licence holders resulting in an estimate of catch of Chinook and Coho salmon and all other species caught recreationally by fishing method, month, and area. The methodology was peer reviewed and accepted at a Canadian Science Advisory Secretariat meeting (CSAS) in June 2015.

The iREC survey obtains data that can be used to estimate complete annual estimates of hatchery marked and wild chinook and coho catch in the recreational fishery at the Pacific Fishery Management Area (PFMA scale). Specific to the Northern Fund, the iREC survey provides complete annual catch estimates for PST specific species, marks and dispositions within the Northern Fund area, as well as dividing catch to the proportions caught from commercial fishing lodges as well as with or without paid fishing guides.

When iREC estimates during low effort periods are combined with peak period creel surveys the result is estimates of total annual Canadian catch of PST relevant species for the first time. This iREC-creel integrated survey approach has the potential to become the official catch estimation tool for the marine recreational fishery in BC. Currently, this combination of creel and iREC estimates is used for the management of the recreational fishery for halibut (SPP) and the department is moving to implementing the approach for chinook and other fish species.

Project objectives

Specific objectives of this project included:

- 1) Operating the monthly iREC survey from April 2016 through March 2018; including salary support of a part-time BiO2 casual position to conduct day to day operational tasks.
- 2) Analyze response data to develop kept and released catch estimates for hatchery-marked and wild Chinook and Coho for all Management Area x Month strata.
- 3) Develop annual calibration factors to calibrate iREC estimates against creel estimates, to correct for biases in the iREC survey.
- 4) Develop calibrated iREC estimates for all strata lacking complete creel estimates.
- 5) Move to operationalize an integrated iREC-Creel survey approach for monitoring recreational fisheries.

This brief report summarizes the results from objectives 1, 2 and 5. As highlighted in the project cost-sharing agreement between the PSC and DFO, the development of ‘calibration factors’ or bias-correction coefficients and calibrated, or bias-corrected, iREC estimates will occur over the next few months, and finalized iREC estimates will be provided to the PSC in May, 2017.

Methods

The methods used to conduct the iREC survey as well as analyse the survey responses are detailed in two reports nearing publication. These reports were presented as research documents through the Canadian Science Advisory Secretariat (CSAS) review process in 2015. The methods were reviewed by a panel of DFO and external experts during a two day review process, and were accepted, pending revisions (DFO 2015). As the revisions are not complete at the time this report was developed – and unpublished CSAS reports are not publically releasable or citeable – we provide a short sketch of the methods here. For further details on iREC survey methods, consult the CSAS publications once they are published (anticipated in June 2017).

Survey methods

The iREC survey consists of a monthly survey of a selection of active licence holders who provide a detailed summary of their recreational fishing activity and retained and released catches via a web-based survey form. Participants can provide responses from the first day of each month until the 20th day of the month following, at which point it is closed and no further access is allowed. The survey can be accessed multiple times, allowing the survey to be used as a diary during the month. After month end, the participant must indicate that they have completely entered their catch, or that they did not fish, for their response information to be included.

Participant selection

Each month, a random sample of between 6,000 and 20,000 recreational licence holders is selected for inclusion in the internet-based iREC survey. Licence categories vary by term (Annual, and 1d, 3d and 5d Term), Canadian Residency (Yes/No) and Age Category (Juvenile, Adult, Senior). Annual licences are valid from the purchase date to the end of the licence year (March 31st), whereas Term licences are valid for a specified date range. Selection rates to the iREC survey differ for annual versus term licences; with Annual licences being selected at approximately 3-5% per month, and Terms at a flat rate of 25%. A given licence can only be selected once, and so the selection probabilities for annual licences are modified by purchase month to ensure that a representative number of licences purchased each month are included in a given monthly survey. Juvenile anglers (under the age of 16) are not selected to participate in the survey. Other than these exceptions, samples are taken randomly with respect to licence category.

Because licences are available for purchase continuously through the season, selection to a particular monthly survey occurs twice. First, a selection is made from those annual licenses purchased prior to the start of a survey month. Second, a selection is made once the survey month is over, from annual licences purchased during the survey month and term licences active during the survey month. This approach ensures that the sample captures differences between people that bought their licences prior to the survey month and those that bought during the month.

Survey invitation

All licence holders selected to participate in a given survey are provided an email directly from DFO that indicates their selection, what is expected, and information about the survey. Information provided includes links to the DFO webpage and FAQ's for iREC, as well as a downloadable form to provide help

with recall and understanding. In addition, the email highlights that the survey contractor will follow up with an email containing the survey link. Those licence holders who were selected for the survey prior to the month receive their invitation email at the beginning of the survey month, and those selected from purchases during the month receive their invitation email at the end of survey month. All invited licence holders also receive a personalized link to the survey website via email.

Survey Approach

The survey first requires the fisher to report all combinations of date, Pacific Fishery Management Area (PFMA) and fishing method that they fished; these combinations are referred to as “Fishing Events”. The survey separates all legal fishing methods into six categories: 1) angling from boat or 2) shore, 3) trapping from boat or 4) shore, 5) hand picking on shore and 6) other (rare) methods.

The survey covers all tidal water PFMA’s on the BC coast. For each Fishing Event, the survey collects catch and release information for all species encountered by the survey participant. As juvenile licence holders are not selected for the survey, adults are asked to report their catch along with that of all licenced anglers less than 16 years of age fishing with them. A test link to the survey can be obtained from the authors if required. In addition, a video tutorial to the survey is available on YouTube, and can be accessed on the DFO YouTube channel here:

<https://www.youtube.com/watch?v=0fAp-9ZZz3g>

We use a contractor to conduct the survey, and the contractor maintains the survey website and collects the fishing information from individual survey participants. The contractor contacts each licence holder selected for the survey using contact information provided by the department and provides a unique clickable link to the survey. The contractor also sends up to two reminder emails to each licence participant who hasn’t completed the survey after the survey month ends and before the close of the survey, 20 days later. The contractor provides all collected data to the department between two and five days after the close of each survey.

Data analysis

As described previously, methods are detailed in a methods document currently in revision. Because of this, we only provide a very brief sketch of the analysis methods. The full methods document will be provided when revisions are complete.

Estimation process

We expand the reported days fished and kept and released catch information from survey responses to estimate total recreational effort and catch. This expansion is done in a stratified manner, with twelve strata reflecting licence characteristics (combinations of licence term, Canadian Residency, Age Category) and whether the licence was purchased prior to or during the survey month. The estimates across all of these analysis strata are summed to generate estimates by month and area of effort and catch. For chinook and coho, catch estimates are generated for clip status as well. Full details of the analysis will be provided when the methods documents are finalized (Houtman et al. *in revision* & O’Brien and Houtman *in revision*).

Bias-correction

We are concerned about the accuracy of these iREC estimates. Because the response data are all fisher-dependent and not all licence holders invited to the survey complete it, there is concern about the estimates being biased. For this reason, annual, species-specific bias-correction factors are developed by regressing these iREC estimates against concurrent PFMA*Month creel estimates. As the creel estimates are also uncertain, a type-II regression approach incorporating uncertainty in creel estimates is used. The regression of iREC on creel estimates are assumed to pass through the origin, and the bias-correction factor is then simply the regression slope. Bias-corrected iREC estimates are the raw iREC estimate divided by the bias-correction factor.

2016 survey developments

The key survey improvements stemming from this project were continued development of bias-correction methodologies with Dr. Carl Schwarz, research into alternative methods of combining iREC and creel estimates with Dr. Josh Korman, improvements to the interactive map and area selection process with Nooro Inc., as well as a range of minor improvements to the survey to improve the user experience, also with Nooro Inc. In addition, we updated the survey instructional video with the video production company Fox and Bee.

Northern Fund contribution

The PSC Northern Fund (NF) provided funds to support a casual hire by DFO to conduct the day to day operations associated with the survey, including: running the participant selection routines and preparing and sending the introductory emails to survey participants; monitoring and responding to the survey email address as well as responding to survey participant questions and concerns about the survey; communicating required information to the survey contractor; running the survey analysis routines and monitoring the results; and compiling survey operational statistics. The NF also provided funds to support survey contractor in conducting the survey through fiscal 2016/17. All survey improvements conducted by Nooro Inc., as well as statistical improvements developed through collaborations with Dr. Schwarz and Dr. Korman were supported via this project. In addition, this project supported the authors to attend and present the iREC methods internationally at the 8th International Fisheries Monitoring and Observer Conference (IFOMC) in San Diego in August 2016.

Results

At this time, survey responses from April 2016 to January 2017 have been received from the survey contractor and analysed. The February 2017 survey ends on March 20th, 2017 and the March 2017 survey will end on April 20th, 2017. Results from these two surveys have yet to be analysed. In addition, the bias-correction of iREC estimates against creel survey estimates has yet to occur. For this reason, preliminary effort and catch estimate results presented here are not provided in absolute terms, only relative. Once bias-corrected estimates of recreational effort and salmon catch are available for the 2016 fishing season they will be provided electronically to the PSC.

Survey selection and participation

Including April 2016 to January 2017, a total of 90,980 licence holders were invited to participate in the iREC survey. When February and March surveys are included, the total number of invitees will increase to approximately 103,000. Again only including the April to January surveys in the 2016/17 recreational licence year, the number individual licence holders providing complete survey responses have totaled 30,359, or 33.4% of invitees (Table 1). Response rates are highest in the low-season, or ‘shoulder months’, and lowest in the peak season months (June – August), when invitations are highest. Often a complete response during the shoulder months consists of a single “I did not fish” response to the survey which we imagine increases the tendency for higher response rates. In contrast, peak period fishing is often quite active, requiring much more effort to completely report through the survey. Response rates – on a licence year basis – have been fairly stable since the first complete licence year of iREC operation in 2013/14; with 30.5% response rates in both 2013/14 and 2014/15 and 30.9% in 2015/16. We hope, with increasing knowledge about the survey from more regular selection to participate, that response rates will improve in the future.

Preliminary effort estimates

The spatial pattern of recreational boat-based fishing effort in 2016/17 is presented in Figure 1. Clear spatial patterns are apparent on the Pacific Coast from Haida Gwaii and the North Coast (left side of Figure 1) through the Central Coast and inside waters of the South Coast and finally around the Southern end of Vancouver Island and ending with the West Coast of Vancouver Island (right side of Figure 1). The highest effort occurs from June through August, with spatial peaks of effort in Pacific Fishery Management Areas (PFMA's) 1, 12/13, 20, 23/123 and 25/125. There are also more minor peaks in PFMA's 2W/142, 4/104, 7/107, 9/109, 14, 29 and 27/127. Year-round fishing occurs most commonly in the Southern Johnstone Strait through the Strait of Georgia and Juan de Fuca Strait than other areas. This pattern is relatively consistent year to year, with approximately 75% of boat-based recreational fishing effort occurring from the beginning of June to the end of August.

Preliminary catch estimates

Preliminary iREC retained chinook, coho and sockeye catch estimates are presented in Figures 2, 3, and 4. As was the case for the effort figure presented previously, all of these catch estimates are not yet bias corrected and thus presented in relative terms only. Catch estimates are relative only to the catch of that species in Figures 2-4. Once bias-corrected estimates are available they will be provided to the PSC electronically and will include the following catch categories by PFMA and month:

- released and retained legal-sized hatchery chinook (adipose clipped);
- released and retained legal-sized wild chinook (adipose present);
- released legal-sized chinook of unknown origin (adipose unspecified);
- released sub-legal chinook (adipose unspecified);
- released and retained hatchery coho;
- released and retained wild coho;
- released and retained coho of unknown origin;
- released and retained sockeye;

released and retained pink;
and released and retained chum.

The spatial and temporal pattern of iREC derived chinook catch estimates (Figure 2) highlights an apparent association with patterns of estimated effort. Peaks in chinook catch correspond quite closely to peaks in effort. Peak chinook catches were observed in PFMA's 1/101, 2W/142, 20, 23/123 and 25/125, with more minor peaks in 7/107 and 13. Chinook were retained in all months, with 'shoulder season' catches most obvious in PFMA's 4/104, 28, 29, 19 & 20.

Retained coho estimates (Figure 3) are more seasonal than chinook, with retained catch mostly occurring in June and later summer and early fall months. Peaks in retained coho catch location exhibit slight differences from effort and chinook peak catches, but are generally similar: peaks occurred in PFMA's 1/101, 4/104 and 23/123. Minor peaks in retained coho catch occurred in PFMA 9/109, 29 and 20.

There were few sockeye recreational fishery openings in 2016, and the relative retained catch estimates from iREC (Figure 4) reflect this. Peak sockeye retained catches occurred in Barkley Sound, the only area where there were directed recreational sockeye fisheries in 2016. There was estimated sockeye in other locations/months up and down the coast, although they were extremely minor in comparison to Barkley sound.

Survey developments

Work this season on the iREC survey associated with this project has focussed on four key objectives: first, we've worked with Dr. Carl Schwarz (SFU) to refine the methods we use for bias-correction. Essentially, bias correction involves regressing iREC estimates on concurrent creel survey based estimates. Creel-based estimates, because they involve fisher-independent information on effort and some aspects of landed catch, are assumed to be more accurate than iREC estimates – which are based exclusively on fisher-dependent information. The regression method accounts for uncertainty in the creel survey estimates, as not accounting for error in the independent variable can result in overestimates of the slope of the iREC – creel relationship. Work this year has focused, using a model selection approach, on the relative value of alternative organization of the iREC and creel data for bias-correction. The initial approach has been to use all available concurrent iREC and creel estimates within a licence year for bias-correction. The ongoing work with Dr. Schwarz focuses on alternative spatial and temporal organization of the data to answer such questions as: 1.) are yearly bias-correction equations appropriate or should a multi-year approach be adopted? 2.) Should the bias-correction be regionally based? This work is in progress and will be reported later. The report stemming from this work will be provided to the PSC.

The second objective of work on the iREC survey this season has been examining methods of combining catch estimates from creel and iREC data to determine total allowable catch. We are working with Dr. Josh Korman (Ecometric Research) to examine alternative methods of combining these two data sources. Perhaps the simplest option is to use creel survey results where they are available and use bias-corrected iREC estimates for areas that have not been creel surveyed. This is the approach used

currently for official halibut catch estimates to the International Pacific Halibut Commission. Our ongoing work with Dr. Korman is examining alternative approaches to combining the data from the two data sources quantitatively; allowing both estimates to influence catch estimates for times and areas where they both exist.

The third objective was to improve the interface where survey participants select the Pacific Fishery Management Area where they fished. This involved a small contract to one of our survey consultants (Nooro), and they made minor improvements to the interactive map. It is now possible for participants to select their location on one survey visit, and the map then defaults to that area on subsequent visits to the site to ease area selection.

Finally, the fourth objective was to update the YouTube video to the latest survey version and incorporate changes made to the survey this and last year. This work was completed by a local Vancouver Island video production company, Fox & Bee Studio (www.FoxandBee.com).

The authors also attended the 8th International Fisheries Observer and Monitoring Conference (IFOMC) in San Diego in late August. Two talks were presented on the iREC methods and results in a session focused on recreational fishery monitoring. The IFOMC proceedings, with extended abstracts of the talks presented by the authors, is available online: <http://ifomc.com/cms/wp-content/uploads/8th-IFOMC-Proceedings-as-of-8-December-2016.pdf>.

Discussion

The 2016 iREC survey was conducted monthly through the entire 2016/17 recreational fishing licence year) via this project. All survey months to date have been completed successfully, and the outstanding survey months (February and March 2017) are in progress or approaching completion. Support for this project was vital to conducting the survey this fiscal year. Estimates are still preliminary, but provide complete methodological, time, area and species coverage of the tidal water recreational fishery. Of specific interest for this project are estimates of boat based angling effort as well as total catch of Pacific salmonids.

Effort and catch estimates

Prior to the availability of bias-corrected catch and effort estimates from the 2016 iREC survey only relative estimates are available. Based on previous bias-correction efforts, iREC estimates are generally biased high relative to creel-based estimates. Previous years bias correction indicates that for chinook, the raw iREC survey estimates range from 1.07 to 1.46 times the corresponding creel survey estimates for chinook and 1.16 to 1.87 times for coho. Bias-correction with concurrent creel surveys is an ongoing requirement for iREC.

We imagine that most of this bias in iREC estimates is due to the fact that only ~30% of randomly selected survey participants actually complete all parts of the catch survey. We term this bias “non-response” bias, and it captures a range of other bias sources that have been commonly attributed to such catch estimation surveys. Essentially, the concern is that survey respondents are not a random

selection of fishers, and thus their fishing activity and catch (and thus the iREC estimates) may not reflect the general fishing population. We are most concerned that anglers who catch little or nothing may be less likely to respond to the survey. In addition, respondents could be composed of a higher proportion of avid fishermen and women who may catch more than the average angler in the general licence holder population. Both of these 'non-response' biases would result in iREC estimates biased in high as observed in past years. Research into the causes and consequences of this non-response bias are underway through another project, and improvements to the survey design to improve response rates generally are also planned.

Developments in 2016

Much of the effort to improve the survey stemming from this project is continuing work. Much of this effort is focused at standardizing the analysis methods, particularly bias-correction and data integration approaches, so we can incorporate iREC estimates into the management of Pacific salmon. The contribution of contractors – supported by this project – has been critical to our progress in this area. Currently, we are including bias-corrected iREC estimates, and thus complete annual catch estimates, in our domestic and international management of Pacific halibut (*Hippoglossus stenolepis*). We hope that the example of iREC data incorporation into halibut management and the improved methods we are developing can support use of iREC estimates into Pacific salmon management in the near future.

References

Tables and Figures

Table 1. The number of licence holders invited to participate, the number of completed surveys obtained and the resulting response rate by month in iREC surveys during the 2016/17 licence year. Note that surveys in February and March 2017 were not complete at the time of report writing, so totals to date do not include those months.

Month	Year	Selected Licence Holders	Completed surveys	Response Rate
April	2016	4840	1817	37.5%
May	2016	9295	3432	36.9%
June	2016	10317	3846	37.3%
July	2016	15911	4613	29.0%
August	2016	15822	4337	27.4%
September	2016	9331	3051	32.7%
October	2016	6845	2337	34.1%
November	2016	6290	2305	36.6%
December	2016	6175	2297	37.2%
January	2017	6154	2324	37.8%
February	2017	6250	n/a	n/a
March	2017	n/a	n/a	n/a
Totals to date		90980	30359	33.4%

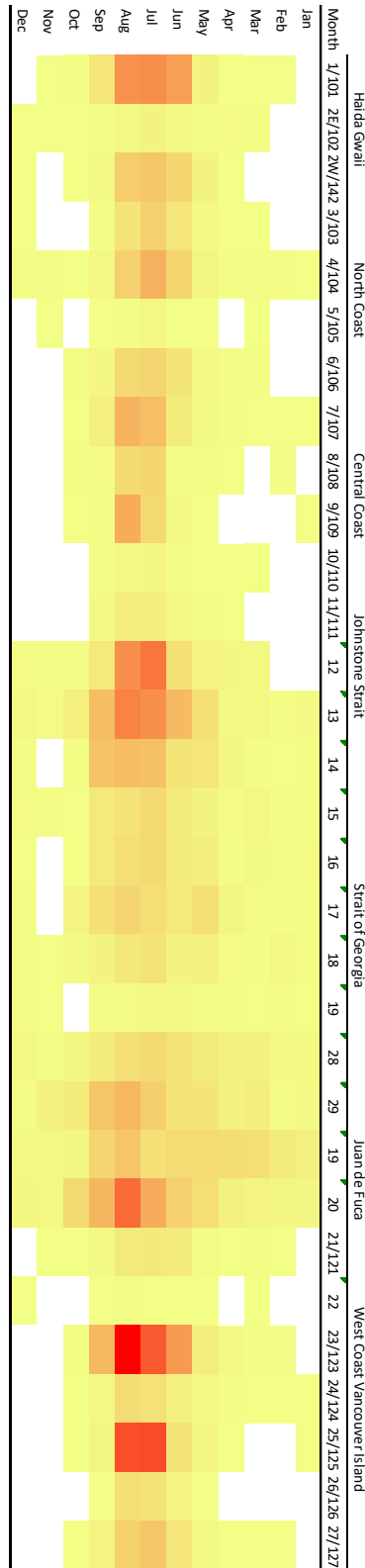


Figure 1. Relative tidal water recreational boat-based angling effort (licencee days) in 2016 by month and area, Pacific Coast. White space indicates zero effort with relative effort increasing to the brightest red colour. Bias-corrected iREC effort estimates will be available in May 2017.

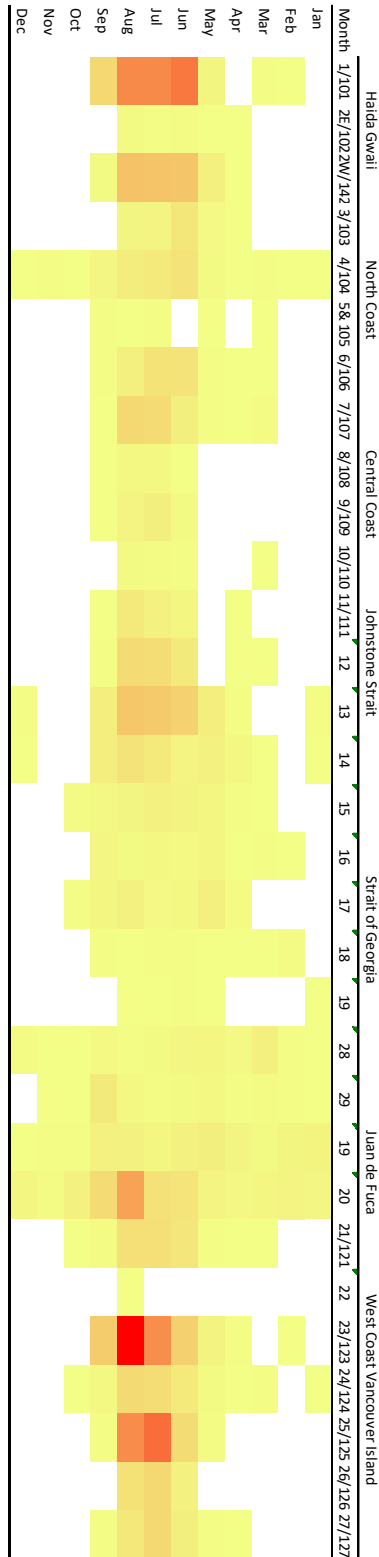


Figure 2. Relative tidal water recreational retained catch of chinook salmon in 2016 by month and area, Pacific Coast. White space indicates zero retained with relative catch increasing to the brightest red colour. Bias-corrected iREC chinook catch estimates will be available in May 2017.

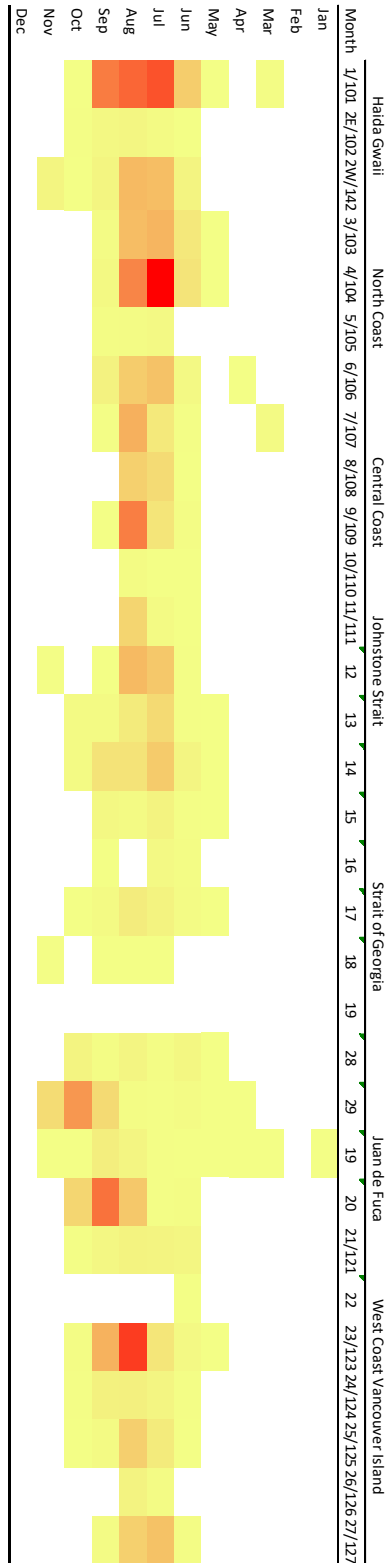


Figure 3. Relative tidal water recreational retained catch of coho salmon in 2016 by month and area, Pacific Coast. White space indicates zero retained with relative catch increasing to the brightest red colour. Bias-corrected iREC coho catch estimates will be available in May 2017.

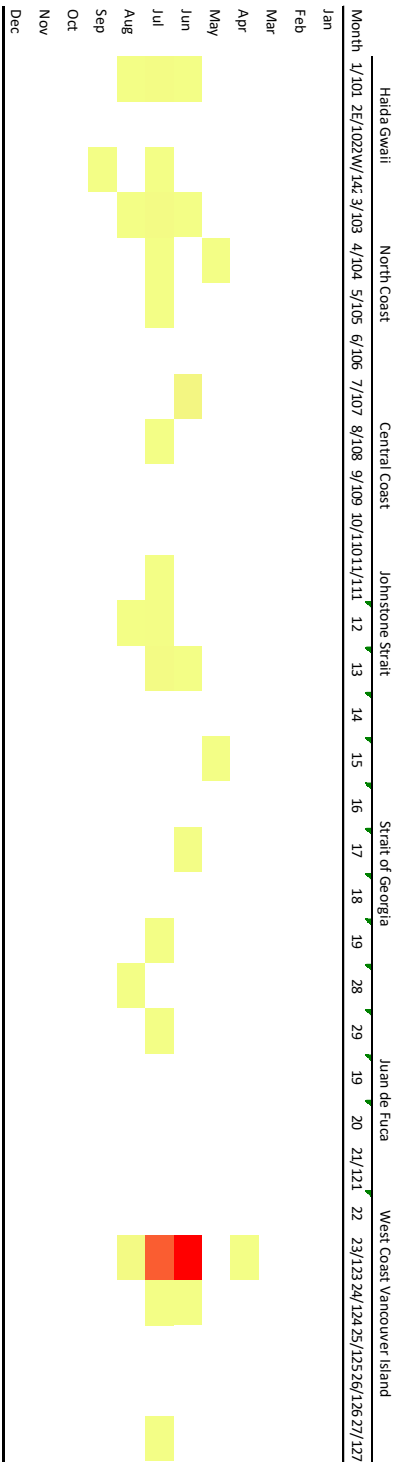


Figure 4. Relative tidal water recreational retained catch of sockeye salmon (pieces) in 2016 by month and area, Pacific Coast. White space indicates zero retained with relative catch increasing to the brightest red colour. Bias-corrected iREC sockeye catch estimates will be available in May 2017.

References

- DFO 2012 Strategic Framework for Fishery Monitoring and Catch Reporting in the Pacific Fisheries. Fisheries and Oceans Canada, Pacific Region, Fisheries and Aquaculture Management. 40 p. http://www.pac.dfo-mpo.gc.ca/fm-gp/docs/framework_monitoring-cadre_surveillance/docs/framework_monitoring-cadre_surveillance-eng.pdf
- Houtman, R., D.S. O'Brien, N. Komick, A.H. Rahme, and K. Hein. In Revision. The "iREC" survey, an internet-based survey of recreational fishing effort and catch in British Columbia tidal waters: methodology and preliminary results. DFO Can. Sci. Advis. Sec. Res. Doc. 2017/XXX. ix + 124 p.
- O'Brien, D.S. and R. Houtman. In Revision. Creel survey calibration of the iREC survey estimates: an integrated monitoring plan. DFO Can. Sci. Advis. Sec. Res. Doc. 2017/XXX. vii + 23 p.

Appendix

Project Evaluation Summary

We briefly summarize the outcomes of the project with respect to the evaluation criteria outlined in Appendix A of the Cost Sharing Agreement:

1. *Did the intended activities take place within scope, within budget?*

Yes and Yes.

2. *Were the resources allocated in the most efficient and effective manner, or given the results would a different allocation have been more appropriate, and if so will be considered for any potential future projects as applicable?*

Likely; this survey is very high priority, and ultimately the goal is to incorporate it's costs completely into operational funding within the department.

3. *Were the milestones achieved?*

Yes, all expected estimates were developed.

4. *Were the deliverables of the project delivered?*

Yes, all deliverables expected at this stage of the project have been delivered. Finalized iREC estimates, bias-corrected by creel survey estimates will be developed over the next several months.

5. *Did the collaboration achieve its purpose?*

Yes. iREC survey was operated monthly through 2016/17 fiscal year, and improvements to the survey were made. As a bonus, the survey methods and results were presented at an international conference.

6. *Were there any difficulties encountered within the performance of the project and if so, how were they managed to achieve resolution?*

No specific difficulties were encountered.

Project Budget & Expenditures

Fisheries and Oceans Canada contributed \$74,085 to the project in Wages and Salaries for David O'Brien and Rob Houtman (\$54,585) and site, project and administrative costs (\$19,500).

The Pacific Salmon Commission (Northern Fund) contributed \$93,620 to the project for Wages and Salaries (\$33,300) and Consultant costs (\$60,320). The PSC funds were dispersed as follows:

Funds	Line item/activity	PO number	Wages & Salaries	Contracts	Travel
Wages & Salaries	iREC biologist (Casual Bi2 hire; Ann Rahme)		\$ 33,300.00		
Contracts	PRA contract (survey implementation)	F1054-160017		\$ 35,364.00	
Contracts	Survey enhancements through NOORO	F1054-160048		\$ 1,870.00	
Contracts	Fox & Bee	F1054-160069		\$ 3,000.00	
Contracts	Carl Schwartz contract	F1054-160068		\$ 9,500.00	
Contracts	Josh Korman contract	F1054-160067		\$ 5,000.00	
Contracts	IFOMC travel (Houtman & O'Brien)				\$ 5,642.00
	Sub Totals		\$ 33,300.00	\$ 54,734.00	\$ 5,642.00
				Grand Total	\$93,676.00