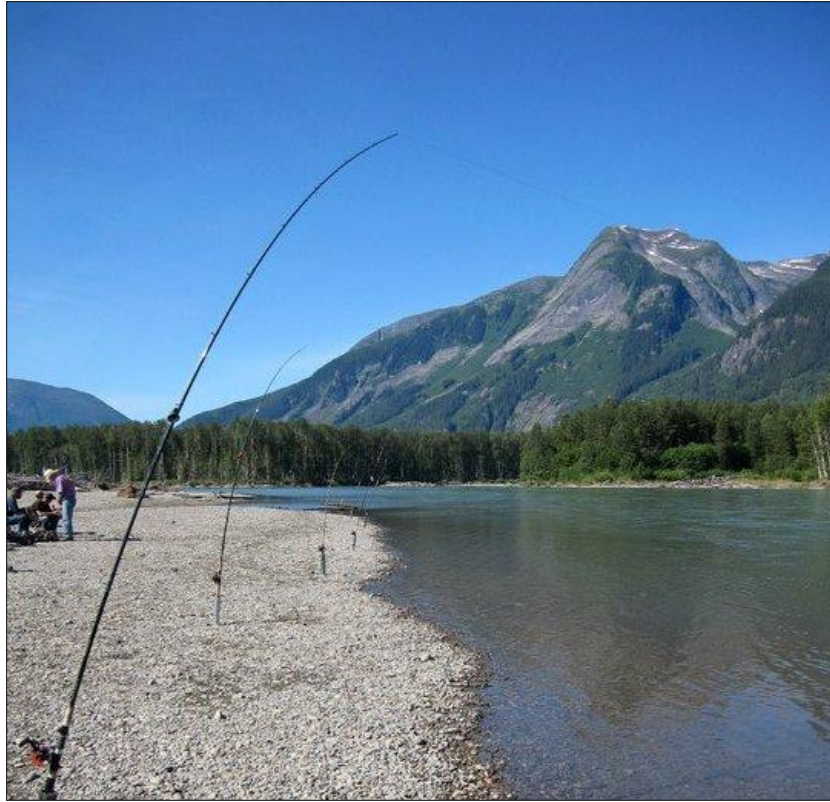


# Skeena Salmon Recreational Fishery Harvest Analysis

## Final Report



Prepared for:

**SkeenaWild Conservation Trust**  
Terrace, BC

October 14, 2010

Prepared by:

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## EXECUTIVE SUMMARY

The Skeena Independent Science Panel was convened in 2008 in response to controversial management decisions regarding Skeena River salmon in 2006 and 2007. As a result, recommendations were made to improve the monitoring and reporting of the recreational harvest of Skeena salmon in both tidal waters and in-river. The objective of this report was to summarize the available information on recreational fisheries that intercepted Skeena salmon in Alaska, Canadian Tidal, and Canadian Non-Tidal waters from 2000 to 2009. The information will generate a clear understanding of the recreational harvest of Skeena River salmon, and allow the Skeena Wild Conservation Trust (SWCT) to consider where monitoring programs could be improved in future years.

In Canadian tidal waters, recreational fishers target mainly chinook and coho. In Haida Gwaii (Areas 1 and 2) the programs are completed annually and managed by the Haida Fisheries Program. Monitoring is through a combination of seasonal creel surveys and a fishing lodge logbook program that are complementary and generally applied consistently from year to year. Fisheries and Oceans Canada (DFO) employs private contractors to administer creel survey programs in areas closer to mouth of the Skeena River (Areas 3 and 4), however large scale creel surveys are only performed in certain years.

In Canadian non-tidal waters, the recreational fishery targets different species depending on the location and timing of the fishery. Monitoring is performed through creel surveys, usually when a specific targeted retention fishery is undertaken in-river. Creel programs are administered by independent contractors or First Nations communities in partnership with DFO. In the Lower Skeena, downstream of Terrace, chinook, pink, and sockeye are the main target species. In the Middle Skeena, upstream of Terrace near Hazelton, and in the Bulkley River the target species is coho. Fisheries in the Babine River target sockeye salmon. The creel surveys are often geographically localized and in some cases, 100% monitoring is performed. Creel survey methods and reporting requirements are not standardized and the information is not gathered in a central, accessible location.

In Alaska, sport fishers intercept Skeena salmon in SE Alaska; between Yakutat and Dixon Entrance, they target mainly chinook and coho. The Alaska Department of Fish and Game (ADF&G) is responsible for management and administers monitoring programs via creel and port surveys, saltwater charter logbooks, and state-wide harvest annual mail surveys. Results are available relatively quickly, the information is summarized and can be accessed on the on the (ADF&G) website.

We recommend better practices for summarizing and reporting recreational catch and harvest information for Skeena River salmon, in particular for Canadian fisheries. Data presented in creel reports are in a wide range of formats and it is sometimes unclear whether the reported estimates

are of total catch (number of fish encountered) or of the total number of fish harvested (number of fish retained). Additionally, there is variation in the unit used to estimate fishing effort which leads to further uncertainty. Increased clarity or standardization of how these measures are reported would be beneficial.

The main difficulty with the recreational harvest data we have assembled is that it is currently not possible to determine what portion of the catch are Skeena River salmon due to the lack of a comprehensive stock composition program for most species. Stock composition estimates for chinook are available only for the 2009 harvest in Canadian management Areas 3 and 4; 33.5% of chinook captured in Area 3, and 43.6% of chinook from Area 4 in 2009 were of Skeena River origin. No similar information has been published for other species, areas, or years.

Lastly, a system is needed to allow stakeholders and the general public to access the information in a timely and efficient manner. A centralized location where all reports regarding sport fishing effort and harvest is contained would be very useful to those wishing to understand and improve the management of sport fisheries that intercept Skeena River salmon.

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## 1. INTRODUCTION

The Skeena River is the second largest watershed in British Columbia. It originates in the Skeena Mountains, 400 km inland from where it drains into Chatham Sound, near Prince Rupert on BC's north coast. The Skeena supports all five salmon species, steelhead, and at least 30 other fish species.

In 2006 and 2007 Fisheries and Oceans Canada (DFO) made a number of controversial management decisions concerning the fishery of Skeena River salmon. These decisions resulted in an intensive public debate, and ultimately led to a review of fisheries management for Skeena River salmon by the Skeena Independent Science Panel in 2008. The objective of the panel was to review the existing fisheries management structure for Skeena River anadromous salmon and recommend a new approach to better manage this fishery in the future. Additionally, the panel was tasked with determining what additional monitoring and data collection would be required to implement Canada's Wild Salmon Policy.

Recommendation 11 of the report to the Skeena Independent Science Panel states that "better estimates of catches by First Nations and anglers are also needed" (Walters *et al.* 2008). This point is re-enforced in an addendum to the original report dated June 13, 2008 (Walters *et al.* 2008b). The addendum states that the independent scientific panel "strongly support(s) the position that reliable catch monitoring procedures be implemented immediately for all marine and freshwater recreational fisheries that catch Skeena salmon and steelhead".

The purpose of this study was to investigate and summarize existing sources of information on the recreational fishery harvest of Skeena River salmon. The results of this study will provide the SkeenaWild Conservation Trust (SWCT) with a clearer picture of the Skeena River recreational fishery harvest. Recommendations from this study will help the SWCT determine how to best allocate future resources in order to increase recreational harvest information.

The scope of this study was limited to recreational fishery harvest information collected in the past ten years (1999-2009) from major recreational fisheries (coho, chinook, and sockeye) in SE Alaska, Haida Gwaii, Prince Rupert and area, and from in-river fisheries in the Skeena watershed. Data and fishery monitoring methodology was provided by Fisheries and Oceans Canada, the BC Ministry of Environment, and the Alaska Department of Fish and Game.

## 2. RECREATIONAL FISHERY HARVEST IN CANADA

### 2.1. Tidal Recreational Fisheries

Tidal recreational fisheries that intercept Skeena River salmon in Canadian waters are managed by DFO Pacific Region, North Coast Area, Fisheries and Aquaculture Management, Resource Management Division. In Canada, the major tidal recreational fisheries that intercept Skeena salmon occur in Areas 1 and 2 (Haida Gwaii) and in areas 3 and 4 (Prince Rupert and Area) (Walters *et al.* 2008). A map of DFO's statistical areas 1 through 4 is provided in Figure 1. In Canada the tidal

recreational fishery for Skeena salmon mainly targets adult chinook and coho salmon. The mean annual recreational harvest of Skeena chinook between 1984 and 2007 was 15% of the total harvest. The mean annual recreational harvest of Skeena coho between 1989 and 2006 was 8% of the total harvest (Walters *et al.* 2008). Skeena River sockeye have not historically been targeted in tidal recreational fisheries and make up a very small fraction of the total recreational harvest (Mark Reagan, Recreational Fisheries Manager DFO pers. comm.). This is in part due to the fact that angling is an ineffective method for catching Skeena sockeye in salt water (Ivan Winther, DFO North Coast, pers. comm.). Pink and chum salmon are generally not targeted by recreational fishers, but are retained in small numbers compared to the recreational harvest of other species. The tidal recreational fishery harvest in Canada is monitored by DFO through two major programs: seasonal creel surveys and a fishing lodge logbook program. The creel survey in areas 1 and 2 is managed by the Haida Fisheries Program, while the creel survey in areas 3 and 4 and logbooks in all areas are managed directly by DFO. Biological sampling, including tissue samples for genetic analysis and coded wire tag (CWT) recovery, is implemented through these programs. The monitoring programs are discussed in more detail below.

A summary of estimated total recreational harvest of salmon in Canadian tidal waters, by region and species, for the years 1999 to 2009 is provided in Table 1. Data presented here may not be exhaustive, but is a summary of information made reasonably accessible through available reports or files directly provided by DFO personnel. Where the data source is not clearly defined with reference to a report and author, the harvest estimates have come from a working data file in use by DFO. It is important to note that the values included in the table are the estimated number of fish *harvested*, and in most cases the estimated catch or number of salmon encountered was higher, with a portion of those fish released.

Figure 1 Map of the BC North Coast showing DFO statistical areas 1 to 4.



**Table 1 Summary of Estimated Canadian Tidal Waters (Areas 1-4) Recreational Salmon Harvest, 1999-2009.**

Year	Location	Survey Description	Total Effort (as noted)	Estimated Total Catch				
				Chinook	Coho	Sockeye	Pink	Chum
1999	(1) QCI North	Lodge log books and Haida Creel	37017 <sup>AD</sup>	21000*	1000*	30*	3400*	150*
	(2E) QCI East	Lodge log books and Haida Creel	-	200*	1000*	-	-	30*
	(2W) QCI West	Lodge log books and Haida Creel	4107 <sup>AD</sup>	4600*	2200*	20*	500*	40*
	(3) Nass and (4) Skeena	Log Books: 15 Charter Operators in Areas 3,4 & 5	5457 <sup>RD</sup>	2000*	1000*	-	436*	27*
<i>1999 Total</i>				<i>27800*</i>	<i>5200*</i>	<i>50*</i>	<i>4336*</i>	<i>247*</i>
2000	(1) QCI North	Lodge Log Books and Haida Creel	39321 <sup>AD,1</sup>	18748	6631	30	4137	901
	(2E) QCI East	Lodge Log Books and Haida Creel		200	1500	0	300	200
	(2W) QCI West	Lodge Log Books and Haida Creel	2464 <sup>RD</sup> , 2674 <sup>AD</sup>	3100	2300	10	250	120
	(3) NASS only	Logbook data from 7 Lodges/Charters		1387	561	11	302	125
	(3) Nass and (4) Skeena	Skeena Tidal Waters Creel Survey		4762 <sup>BD</sup>	4421	3484	66	1342
<i>2000 Total</i>				<i>27856</i>	<i>14476</i>	<i>117</i>	<i>6331</i>	<i>1435</i>
2001	(1) QCI North	Lodge Log Books and Haida Creel	36641 <sup>AD</sup>	20728	37435	27	4006	675
	(2E) QCI East	Lodge Log Books and Haida Creel	-	300	10000	0	30	100
	(2W) QCI West	Lodge Log Books and Haida Creel	9618 <sup>AD</sup>	9300	12200	10	100	100
	(3) Nass and (4) Skeena	Skeena Tidal Waters Creel Survey	9260 <sup>RD</sup>	10807	14027	153	2996	349
<i>2001 Total</i>				<i>41135</i>	<i>73662</i>	<i>190</i>	<i>7132</i>	<i>1224</i>
2002	(1) QCI North	Haida Creel Survey only	36585 <sup>AD</sup>	31136	25352	45	1248	297
	(2E) QCI East	Haida Creel Survey only	-	300	7000	0	500	100
	(2W) QCI West	Haida Creel Survey only	12345 <sup>AD</sup>	15600	9700	0	80	120
	(3) Nass and (4) Skeena	Skeena Tidal Waters Creel Survey	9834 <sup>BT</sup>	7868	20257	21	1847	130
<i>2002 Total</i>				<i>54904</i>	<i>62309</i>	<i>66</i>	<i>3675</i>	<i>647</i>
2003	(1) QCI North	Lodge Log Books and Haida Creel	41700 <sup>AD</sup>	34314	31353	10	1794	548
	(2E) QCI East	Lodge Log Books and Haida Creel	-	300	2000	0	50	50
	(2W) QCI West	Lodge Log Books and Haida Creel	14075 <sup>AD</sup>	19650	12200	0	220	60
	(3) Nass and (4) Skeena	No Sampling Conducted	-	-	-	-	-	-
<i>2003 Total</i>				<i>54264</i>	<i>45553</i>	<i>10</i>	<i>2064</i>	<i>658</i>
2004	(1) QCI North	Lodge Log Books and Haida Creel	44219 <sup>AD</sup>	51930	41573	103	675	1436
	(2E) QCI East	Lodge Log Books and Haida Creel	-	250	1000	0	30	30
	(2W) QCI West	Lodge Log Books and Haida Creel	15542 <sup>AD</sup>	21750	900	20	450	490
	(3) Nass and (4) Skeena	No Sampling Conducted	-	-	-	-	-	-
<i>2004 Total</i>				<i>73930</i>	<i>43473</i>	<i>123</i>	<i>1155</i>	<i>1956</i>
2005	(1) QCI North	Lodge Log Books and Haida Creel	44717 <sup>AD</sup>	44768	33867	93	1381	583
	(2E) QCI East	Lodge Log Books and Haida Creel	-	1000	1000	0	30	30
	(2W) QCI West	Lodge Log Books and Haida Creel	17374 <sup>AD</sup>	23000	16500	20	310	170
	(3) Nass and (4) Skeena	No Sampling Conducted	-	-	-	-	-	-
<i>2005 Total</i>				<i>68768</i>	<i>51367</i>	<i>113</i>	<i>1721</i>	<i>783</i>
2006	(1) QCI North	Lodge Log Books and Haida Creel	26215 <sup>UE</sup>	35009	36342	103	964	196
	(2E) QCI East	Lodge Log Books and Haida Creel	-	1000	1000	0	50	30
	(2W) QCI West	Lodge Log Books and Haida Creel	-	28000	8200	70	450	230
	(3) Nass and (4) Skeena	Abridged Skeena Tidal Waters Creel	-	1410*	18862*	-	-	-
<i>2006 Total</i>				<i>65419</i>	<i>64404</i>	<i>173</i>	<i>1464</i>	<i>456</i>
2007	(1) QCI North	Lodge Log Books and Haida Creel	23889 <sup>UE</sup>	29315*	29579	120	1037	422
	(2E) QCI East	Lodge Log Books and Haida Creel	-	500*	500	-	-	-
	(2W) QCI West	Lodge Log Books and Haida Creel	-	22500*	12100	10	430	50
	(3) Nass and (4) Skeena	No Sampling Conducted	-	-	-	-	-	-
<i>2007 Total</i>				<i>52315</i>	<i>42179</i>	<i>130</i>	<i>1467</i>	<i>472</i>
2008	(1) QCI North	Lodge Log Books and Haida Creel	23889 <sup>UE</sup>	25226	36636	132	3972	190
	(2E) QCI East	Lodge Log Books and Haida Creel	-	500	1000	-	-	-
	(2W) QCI West	Lodge Log Books and Haida Creel	-	17000	8500	10	450	30
	(3) Nass and (4) Skeena	Skeena Tidal Waters Creel Survey	-	11970	34215	-	-	-
<i>2008 Total</i>				<i>54696</i>	<i>80351</i>	<i>142</i>	<i>4422</i>	<i>220</i>
2009	(1) QCI North	Lodge Log Books and Haida Creel	20527 <sup>UE</sup>	19500	35473	29	1483	546
	(2E) QCI East	Lodge Log Books and Haida Creel	-	500	3800	-	300	-
	(2W) QCI West	Lodge Log Books and Haida Creel	-	14000	16700	10	300	200
	(3) Nass and (4) Skeena	Skeena Tidal Waters Creel Survey	10529 <sup>BT</sup>	9177	40324	-	1900	-
<i>2009 Total</i>				<i>43177</i>	<i>96297</i>	<i>39</i>	<i>3983</i>	<i>746</i>
<b>Grand Total</b>				<b>564264</b>	<b>579271</b>	<b>1153</b>	<b>37750</b>	<b>8844</b>

\* preliminary estimate

" - " no data/no sampling

<sup>1</sup> Combined effort for Areas 1, 2E, and 2W

AD "Angler Days"

RD "Rod Days"

BD "Boat Days"

BT "Boat Trips"

UE "Undescribed Effort"

*Areas 1 and 2*

DFO monitors the Haida Gwaii recreational fishery in Areas 1 and 2 through a combination of seasonal creel surveys and the fishing lodge logbook program. The creel program and logbook program have been conducted annually since 1995. The Haida Fisheries Program initiated the Haida Gwaii Creel Program in 1995 for monitoring recreational fisheries in DFO statistical areas 1, 2E, and 2W. In 1997 and 1998 the Creel Program was reviewed by LGL Limited. This review resulted in a number of improvements to the Creel program and the program has remained largely unchanged to this day. Detailed methodology for the Creel program can be found in Bocking and Searing (2000).

The Creel program generates harvest statistics for the north coast of Graham Island, including Langara, Masset Inlet, and Naden Harbour (Area 1) and for Rennel and Cartwright Sounds (Area 2W). Angler interviews and boat counts are the key data collection components of the Creel program. Boat counts (by fixed wing aircraft and small boat) are used to derive expansion factors to estimate total effort and harvest from data collected during angler interviews. Angler interviews in Area 2E, including Skidegate Inlet, were conducted prior to 1997; however, this is no longer the case and the creel program no longer generates estimates for this area. Angler interviews in Area 1 include independent/charter anglers and anglers from lodgers, while angler interviews in area 2W include independent/charter anglers only. As such, the Creel program in Area 2W only generates estimates for independent/charter anglers and DFO logbook data is used to estimate harvest numbers for lodges. Data for each year is appended to historic data and provided to DFO in annual summary reports.

The fishing lodge logbook program is administered directly by DFO and requires that lodge and charter operators maintain a daily log of fishing effort (rod days) and catch throughout the season. Also, DFO Charter Patrolmen opportunistically interview independent anglers for effort and harvest. The logbooks are submitted to DFO and harvest and effort are estimated by area. Harvest statistics from the logbook program are determined by DFO and are annually appended to historic data.

The final estimate of recreational harvest is driven by a tally of the census data from the fishing lodge logbook program with the Creel program filling in the gaps for areas such as Sandspit, QCC, Rennel Sound, Masset. In areas where the Creel program overlaps with the fishing lodge logbook program, the logbook data is what is used. The Creel program is also used in season to gauge abundance and it provides an estimate of released fish which is not captured in the fishing lodge logbook program (Peter Katinić, Assistant Resource Manager DFO, pers. comm.).

In addition to harvest estimates the Creel program includes a biological sampling component that is conducted by creel surveyors. This includes the collection of fish length, ageing structures (scale and otolith), and fish heads from hatchery marked fish for the recovery of coded wire tags. Historically genetic samples have not been collected as part of the Creel Program and stock composition is not reported in annual creel reports.

*Areas 3 and 4*

DFO monitors the Prince Rupert recreational fishery in Areas 3 and 4 from the beginning of June to the middle of September through a combination of seasonal creel surveys and a fishing lodge logbook program. The creel survey model has followed the model used by DFO in the Strait of Georgia since 1982 (English *et al.* 2002); however, the level of effort in each year has been variable due to funding constraints (Mark Reagan, Recreational Fisheries Manager DFO, pers. comm.). Creel surveys, including the logbook program, were conducted in 2000, 2001, 2002, 2008, and 2009. The logbook program without the creel survey was conducted in 1999 and an abridged creel survey (limited season of August 1 – September 15) was conducted in 2006. There is no catch information available for 2003, 2004, or 2005. Detailed methodology for the 2009 creel survey can be found in van Tongeren (2009). The 2009 creel survey is an accurate representation of creel surveys conducted during the previous 10 years in Areas 3 and 4 (Mark Reagan, Recreational Fisheries Manager DFO, pers. comm.). Methodology from the 2009 creel survey is summarized below.

The creel survey generates harvest statistics for Areas 3 and 4, comprising the waters of Chatham Sound between the mouths of the Nass and Skeena Rivers. Chatham Sound is bordered by Porcher Island in the South, Dundas and Stephens Islands groups to the west, and the Alaska/BC border to the North. The creel survey incorporates three main components in addition to the annual logbook program: an access point ground survey, an aerial survey, and a fishing boat trailer census. These three components generate estimates for independent/charter anglers, while the logbook data is used to estimate harvest for fishing lodges. The access point ground survey collects harvest information, angling activity times, and biological samples from selected species from anglers as they land at boat ramps and marinas. This data is used to calculate species and strata specific catch per unit effort (CPUE) values and create angler activity profiles. The sampling goal for the access point ground survey in 2009 was 20% of fishing effort from each month. The aerial survey is used to record the number of observed boats in each sub-area by flying along a standard flight path in a fixed wing aircraft. A total of 32 flights were conducted in 2009. Boat counts collected during aerial surveys are used to calculate total fishing effort in each sub-area. The fishing boat trailer census records the number of empty boat trailers at two of the access point ground survey locations. Trailer counts are conducted during similar times as the aerial surveys to provide a proxy of fishing effort during days where there are no overflights. Trailer counts also provide an economical way to track changes in effort between days. Pacific Scientific Advice Review Committee (PSARC) reviewed data entry and analysis tools, known as the Catch and Release Estimation Tools (CREST), are used to enter and analyze the creel survey data. Harvest statistics for each year are appended to historic data and a Creel Survey Statistics Report, including methods and results, is produced by DFO.

The fishing lodge logbook program requires that lodge operators maintain a daily log of fishing effort (rod days) and harvest throughout the season. In 2009 logbooks were completed for three lodges in Area 3. No lodges were operating in Area 4. Logbook data provides a census of fishing lodge angling activity. In years where the other components of the creel survey are conducted, the log book data is incorporated into the overall harvest estimate.

Creel staff also collect biological data from a subset of chinook and coho salmon at access point ground survey locations. Biological data for chinook includes fork length, gender, flesh colour, scale samples, and presence of adipose marks. For coho, data on fork length, gender, and presence of adipose fin marks are collected. Heads are retained from hatchery marked fish wherever possible for CWT recovery. Stock composition and catch-at-age is determined for chinook from samples that are submitted to the Pacific Biological Station for age and genetic analysis. Results of the biological analysis are presented by DFO in the Creel Survey Statistics Report.

A new report published by DFO (van Tongeren and Winther 2010) shows the results of a recent DNA study of chinook salmon harvested recreationally in Areas 3 and 4. The report contains information on the stock composition of chinook from the 2009 Area 3 and 4 creel survey. Stock identification was performed on scales collected in scale books by creel survey personnel. The scales were analyzed for fish age and then used for DNA extraction. The results show that 33.5% of chinook captured in Area 3, and 43.6% of chinook from Area 4 in 2009 were of Skeena River origin. No similar information is given for other species or other years.

## 2.2. Non-Tidal Recreational Fisheries

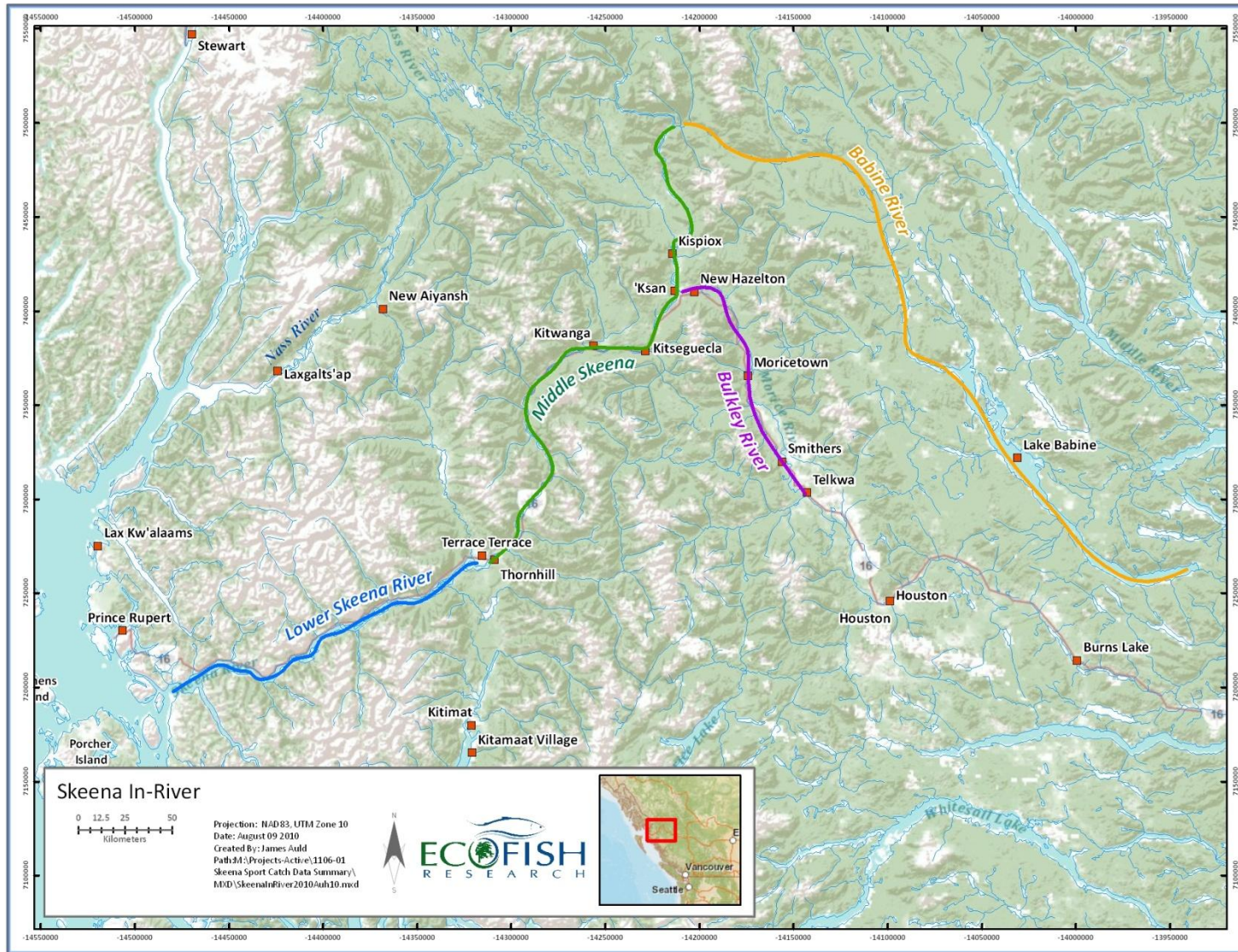
Non-tidal recreational fisheries for anadromous salmon in the Skeena River (BC Freshwater Management Region 6) are managed by DFO Pacific Region, North Coast Area, Fisheries and Aquaculture Management, Resource Management Division, while the steelhead recreational fishery in the Skeena River is managed by the BC Ministry of Environment (MOE), Fish and Wildlife Science and Allocation Section. Recreational fisheries for salmon in the Skeena River occur throughout the watershed with the most intensive pressure occurring in the lower Skeena River, downstream of Terrace, and in the Babine Lake watershed. Major target species include chinook, coho, and sockeye. Steelhead recreational fishing occurs most intensively in tributaries to the Skeena River, including the Bulkley River. The recreational fishery for steelhead is a catch and release fishery and there is no recreational harvest of steelhead in the Skeena River. Further, while the BC MOE does administer recreational creel surveys in the Skeena watershed, the focus of such investigations is on steelhead anglers and thus, little or no information on other species of salmon is collected or reported. As such, we have not included steelhead in the harvest analysis and they will not be discussed further in this report. The non-tidal recreational fishery for salmon in the Skeena River is primarily monitored by DFO through creel surveys, often supported through First Nations programs.

It is convenient to examine the in-river recreational creel survey data by first dividing the Skeena River into four regions (Figure 2). The first region comprises the section of the river downstream from Terrace and will be referred to as the *Lower Skeena*. The second region includes the river section upstream of Terrace to the confluence of the Babine River and the Skeena mainstem, and will be referred to as the *Middle Skeena*. It includes the communities of Kitwanga, Ksan and Hazelton at the mouth of the Bulkley River, and Kispiox. The third region (*Bulkley River*) comprises the Bulkley River upstream of the Skeena and includes fishing locations near Smithers and

Moricetown. The fourth and final region (*Babine River*) includes recreational fishing locations on the Babine River and Babine Lake.

Available harvest data for in-river recreational fisheries from 1999 to 2009 is presented in Table 2. Data presented here may not be exhaustive, but is a summary of information made reasonably accessible through available reports or files directly provided by DFO personnel. Where the data source is not clearly defined with reference to a report and author, the harvest estimates have come from a working data file in use by DFO. It is important to note that the values included in the table, as with previously considered data from tidal fisheries, are the estimates number of fish *harvested*, and in most cases the estimated catch or number of salmon encountered was higher, with a portion of those fish released

Figure 2 Map of the Skeena River showing the lower Skeena, middle Skeena, Bulkley, and Babine regions.



**Table 2 Summary of Creel Survey Estimates of In-River Recreational Salmon Harvest for the Skeena River, 1999-2009.**

Year	Location	Survey Description	Dates	Total Effort (angler hours)	Estimated Total Harvest				
					Chinook	Coho	Sockeye	Pink	Chum
1999	Lower Skeena	Lower Skeena Creel: Chinook fishery, J.O. Thomas & Assoc.	-	12067	595	20	0	155	0
	Lower Skeena	Lower Skeena Creel: Pink fishery, J.O. Thomas & Assoc.	-	4681	15	0	0	210	0
	Lower Skeena	Lower Skeena Creel: Coho fishery, J.O. Thomas & Assoc.	11 Sep - 31 Oct	9209	0	551	0	47	0
	Lower Skeena	Lower Skeena Monitoring Program (Preliminary)	27 Jul - 7 Aug	-	456*	-	-	-	-
	Upper Skeena	Upper Skeena Monitoring Program (Preliminary)	1 Aug -15 Aug	-	-	-	-	83*	-
	Bulkley River	Bulkley:Toboggan Creek (Preliminary)	22 Sep - 31 Oct	-	-	55*	-	-	-
<i>1999 Total</i>				<i>22957</i>	<i>1066</i>	<i>626</i>	<i>0</i>	<i>495</i>	<i>0</i>
2000	Middle Skeena	2000 Kitwanga River Mouth Creel, Gitxsan Watershed Authorities	-	-	-	-	data unavailable		-
	Middle Skeena	2000 Kispiox River Chinook Creel, Gitxsan Watershed Authorities	-	-	146*	-	-	-	-
	Bulkley River	Toboggan Creek Marked Coho Fishery	-	-	-	54*	-	-	-
<i>2000 Total</i>				<i>-</i>	<i>146*</i>	<i>54*</i>	<i>-</i>	<i>-</i>	<i>-</i>
2001	Middle Skeena	2001 Kitwanga River Mouth Creel, Gitxsan Watershed Authorities	15 Aug -31 Aug	642	3	14	0	55	0
	Middle Skeena	2001 Bulkley River Mouth Creel, Gitxsan Watershed Authorities	20 Aug - 4 Sep	1635	0	182	0	0	0
	Bulkley River	2001 Toboggan Creek sport fishery survey summary report. J.O. Thomas & Associates Ltd. Vancouver, BC.	-	-	-	-	data unavailable		-
	Lower Skeena	2001 Lower Skeena Creel: J.O. Thomas & Assoc.	-	-	-	-	data unavailable		-
<i>2001 Total</i>				<i>2277</i>	<i>3</i>	<i>196</i>	<i>0</i>	<i>55</i>	<i>0</i>
2002	Bulkley River	2002 Bulkley River Creel Survey, Wet'suwet'en Fisheries	21 Aug - 30 Sep	6358	21	540	2	182	0
	Middle Skeena	2002 Kitwanga and Bulkley River Mouth Creel, Gitxsan Watershed Authorities	-	4562	1 <sup>+</sup>	332	3 <sup>+</sup>	852 <sup>+</sup>	14 <sup>+</sup>
	Babine River	2002 Babine River Sport Survey, Lake Babine First Nation	16 Aug - 26 Sep	13039	0	0	4476	0	0
<i>2002 Total</i>				<i>23959</i>	<i>22</i>	<i>872</i>	<i>4481</i>	<i>1034</i>	<i>14</i>
2003	Lower Skeena	2003 Lower Skeena Creel: J.O. Thomas & Assoc.	16 June - Aug 31	203588	5711	76	1693	1818	0
	Middle Skeena	2003 Kispiox River Mouth Creel, Gitxsan Watershed Authorities	30 Aug - 14 Sep	437	0	57	0	0	0
	Babine River	2003 Babine River Sport Survey, Lake Babine First Nation	10 Aug - 10 Sep	9904	0	0	5942	-	0
<i>2003 Total</i>				<i>213929</i>	<i>5711</i>	<i>133</i>	<i>7635</i>	<i>1818</i>	<i>0</i>
2009	Babine River	Babine River (Fulton and Pinkut) Creel Survey	-	-	-	-	15000*	-	-
	-	Skeena Mainstem Estimate	-	-	-	-	5000*	-	-
<i>2009 Total</i>				<i>-</i>	<i>-</i>	<i>-</i>	<i>20000*</i>	<i>-</i>	<i>-</i>
<b>Grand Total</b>				<b>266122</b>	<b>6948</b>	<b>1881</b>	<b>12116</b>	<b>3402</b>	<b>14</b>

" - " data unavailable

\* preliminary estimate

" +" total catch, harvest rate lower but unclear, estimated from report figures

### ***Lower Skeena***

DFO monitors the recreational fishery in the Lower Skeena, including fishing locations from China Bar to Ferry Island, through a seasonal creel survey program. The primary species harvested are chinook, pink, and sockeye salmon. Recreational fishing activities occur year round but are at a peak from June to October, coinciding with the salmon migration. The timing of the creel program varies by year; usually starting in mid-June and going until either August or October, based on the operating budget. We were able to locate reports from the Lower Skeena creel program for 1999 and 2003 (J.O. Thomas & Associates 1999 and Tallman 2004). Detailed methodology for the 2003 creel survey can be found in Tallman (2004).

The *Lower Skeena* creel program is the largest survey of recreational fishers on the Skeena River, both geographically and temporally, and typically utilizes both access point and roving survey methods at multiple sites. The creel survey program in this region has typically been contracted to an independent scientific consultant. In many years the contractor has been J.O. Thomas & Associates (Vancouver, B.C.). During the past decade, the creel survey has delivered catch estimates by species (both number of fish harvested and released), angler effort, and angler demographics.

Biological sampling was also part of the creel program. Information on fish size (fork length), incidence of adipose-clipped hatchery fish, flesh colour (chinook), scale samples and caudal fin tissue samples were collected when possible for genetic analysis. Heads are retained from hatchery marked fish wherever possible for CWT recovery.

### ***Middle Skeena***

The Gitxsan Watershed Authorities performed creel surveys in the region downstream of Hazelton, B.C. from 2000 to 2003 inclusively; however, reports were only available from 2001 onwards (Hall and Gottesfeld 2001a, 2001b, 2003 and Hall 2004). The target species for the creel programs appears to have been coho salmon and surveys were implemented during targeted coho fisheries. Access point surveys were performed at locations near Kitwanga, Ksan (at the mouth of the Bulkley River) and Kispiox, though not all sites were surveyed in every year. The sampling coverage was high, up to 100% monitoring in the case the 2001 Kitwanga and 2003 Kispiox surveys where all available angler hours (6am to 9pm, dawn to dusk) were surveyed for the duration of the coho retention opening.

Creel reports for the Middle Skeena provide clear harvest estimates for coho, but less so for other salmon species. In 2002 in particular, the total estimated catch of each species was provided, but data on the number of fish actually harvested was only reported for coho. The impact of the fishery on other species of salmon was unclear; however, it may be reasonable to assume that retention of non-target species would have been low. During the 2003 coho fishery at Kispiox, fishers were primarily aboriginal and the majority of coho retained were harvested for food and ceremonial purposes. It is uncertain whether the fishery would have been considered as part of the recreational harvest statistics or not.

Biological sampling was also conducted as part of the creel program; however this was inconsistent between years. In some cases, coho were measured (fork length) and genetic samples were reportedly collected, while at other times information on the frequency of adipose clipped coho was recorded, but biological sampling activities were not reported.

### ***Bulkley River***

An access point creel survey was undertaken by Wet'suwet'en Fisheries (Morisetown, B.C.) during a coho retention fishery in 2002 (Saimoto 2003). Four fishing locations on the Bulkley River were surveyed including Morisetown Canyon, Toboggan Creek, Chicken Creek and the Telkwa/Bulkley confluence. Target species were coho and steelhead. Sampling effort was stratified by month and day type (weekday or weekend) and survey shifts were randomly selected in an effort to ensure representative sampling of the fishery. It is unclear if the data reported is an estimated catch or the estimated number of fish harvested.

### ***Babine River***

Access point creel surveys were performed by the Lake Babine First Nation in 2002 and 2003 (Lake Babine First Nation 2003, 2004). Monitoring occurred in the channel between Nilkitkwa and Babine Lakes near the location of the salmon counting fence. Fishing activity on the river is concentrated at this site due to limited access to fishing sites on other parts of the watershed. The fishery is restricted to fly-fishing only and targets sockeye salmon in years where returns are in excess of spawning capacity, with coho being utilized to a lesser extent when opportunities exist. Sockeye and coho salmon were the species of concern during the creel survey, with data on other salmon species encountered (chinook, steelhead, and pink) recorded in lesser detail. The Babine Lake sockeye population is an enhanced stock with a significant proportion of the population spawning in Fulton and Pinkut spawning channels.

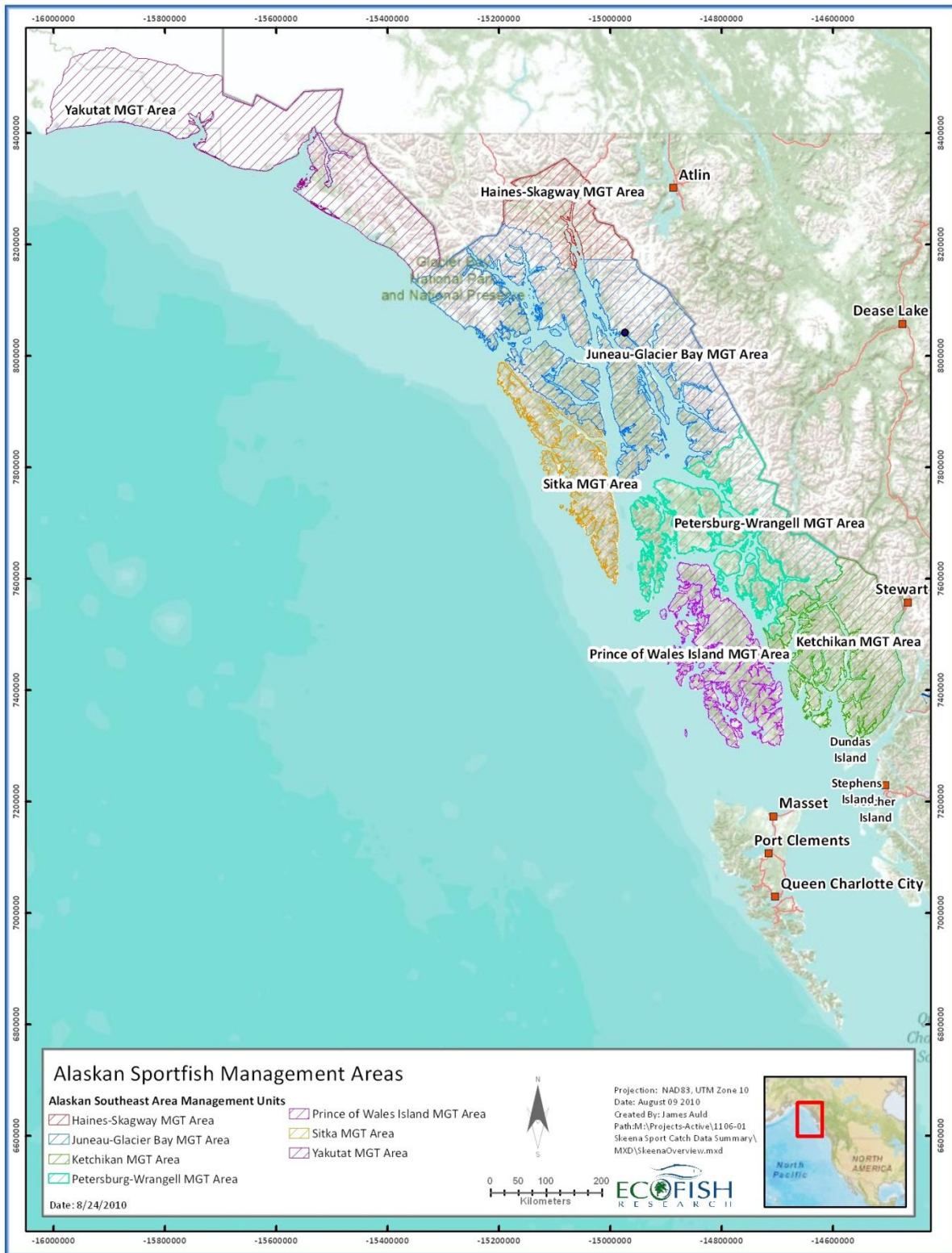
## **3. RECREATIONAL FISHERY HARVEST IN ALASKA**

### **3.1. Alaska Department of Fish and Game**

The Pacific Salmon Commission coordinates the management of transboundary fisheries for Pacific salmon according to the agreements set out in the US/Canada Pacific Salmon Treaty. The commission is responsible for providing regulatory advice and recommendations; however, each country is responsible for regulating fisheries in their territorial waters. The major tidal recreational fishery that intercepts Skeena salmon in Alaskan waters occurs in SE Alaska; between Yakutat in the north and the mouth of Dixon Entrance near Ketchikan in the south (Figure 3). The Alaska Department of Fish and Game, Sportfish Division for SE Alaska is responsible for managing tidal recreational fisheries in SE Alaska. The tidal recreational fishery in SE Alaska mainly targets adult chinook and coho salmon. Chinook and coho salmon are available year round in Alaska; however, peak fishing effort typically occurs between May and September, coincident with the return of maturing fish. The tidal recreational fishery in Alaska is monitored by the Alaska Department of

Fish and Game (ADF&G) through three major programs; creel and port surveys, saltwater charter logbooks, and statewide harvest annual mail surveys. Biological sampling, including tissue samples for genetic analysis and CWT recovery, is implemented through these programs and they are discussed in more detail below. A summary of the estimated total recreational harvest of salmon in SE Alaska, by species and region for the years 1999 to 2008 is provided in Table 3. Final estimates for the 2009 season were not available at the time this report was completed.

Figure 3 Map showing SE Alaska fisheries management area (Region 1).



**Table 3 Summary of Estimated Recreational Salmon Harvest in SE Alaska, 1999-2008.**

Year	Location	Effort	Estimated Total Catch				
		(days fished)	Chinook	Coho	Sockeye	Pink	Chum
1999	(A) Ketchikan	78253	7882	51561	1966	33796	3237
	(B) Prince of Wales Island	57836	8518	71496	1599	13193	850
	(C) Kake, Petersburg, Wrangell, Stikine	40613	7159	11687	496	3425	945
	(D) Sitka, North Chichagof	96789	28548	75050	6929	11337	1680
	(E) Juneau	118579	11207	49757	1513	21938	3311
	(F1) Skagway	6156	615	385	0	537	126
	(F2) Haines	8936	553	295	0	200	28
	(G) Glacier Bay	21556	2095	11793	85	8728	407
	(H) Yakutat	6661	649	10169	213	40	16
<i>1999 Total</i>		<i>435379</i>	<i>67226</i>	<i>282193</i>	<i>12801</i>	<i>93194</i>	<i>10600</i>
2000	(A) Ketchikan	83265	9570	32760	2736	24415	9089
	(B) Prince of Wales Island	49074	6755	43530	1631	10032	2144
	(C) Kake, Petersburg, Wrangell, Stikine	42768	6926	2455	352	616	622
	(D) Sitka	84602	18888	39182	2170	4747	2851
	(E) Juneau	112896	11553	37632	1129	8580	6712
	(F1) Skagway	8463	1068	185	0	219	47
	(F2) Haines	8288	274	233	96	632	90
	(G) Glacier Bay, North Chichagof	38126	3217	12522	172	2444	866
	(H) Yakutat	7462	706	3377	363	51	39
<i>2000 Total</i>		<i>434944</i>	<i>58957</i>	<i>171876</i>	<i>8649</i>	<i>51736</i>	<i>22460</i>
2001	(A) Ketchikan	69500	10316	46070	1248	20712	5906
	(B) Prince of Wales Island	52338	7455	82477	1209	16222	2075
	(C) Kake, Petersburg, Wrangell, Stikine	31613	6367	4902	879	2646	402
	(D) Sitka	87657	24205	83377	1829	5287	2523
	(E) Juneau	105359	13815	48077	1328	12182	8023
	(F1) Skagway	6607	798	136	0	257	105
	(F2) Haines	10265	454	176	239	517	26
	(G) Glacier Bay, North Chichagof	38963	2711	25250	146	7616	1496
	(H) Yakutat	6626	548	6548	126	160	11
<i>2001 Total</i>		<i>408928</i>	<i>66669</i>	<i>297013</i>	<i>7004</i>	<i>65599</i>	<i>20567</i>
2002	(A) Ketchikan	78942	12366	54632	1024	27577	3479
	(B) Prince of Wales Island	49326	11917	67994	1585	16750	2505
	(C) Kake, Petersburg, Wrangell, Stikine	37140	6624	7226	921	1136	265
	(D) Sitka	63361	17994	39809	1206	7544	1911
	(E) Juneau	91889	12786	46027	505	7484	2989
	(F1) Skagway	4747	883	245	0	233	55
	(F2) Haines	8670	667	642	550	397	48
	(G) Glacier Bay, North Chichagof	28506	2838	29636	544	8902	537
	(H) Yakutat	5025	678	3803	310	0	0
<i>2002 Total</i>		<i>367606</i>	<i>66753</i>	<i>250014</i>	<i>6645</i>	<i>70023</i>	<i>11789</i>
2003	(A) Ketchikan	66443	11788	50596	2909	24913	6230
	(B) Prince of Wales Island	53687	7793	87950	939	15095	3430
	(C) Kake, Petersburg, Wrangell, Stikine	25478	5877	7734	655	1586	315
	(D) Sitka	66237	21727	67997	2124	6459	2815
	(E) Juneau	102328	13147	47671	764	11696	4680
	(F1) Skagway	5236	1211	448	0	110	50
	(F2) Haines	8801	888	377	138	423	98
	(G) Glacier Bay, North Chichagof	32109	3325	19625	604	5037	1976
	(H) Yakutat	8970	355	8495	561	227	180
<i>2003 Total</i>		<i>369289</i>	<i>66111</i>	<i>290893</i>	<i>8694</i>	<i>65546</i>	<i>19774</i>

Table 3 (cont.). Summary of Estimated Recreational Salmon Harvest in SE Alaska, 1999-2008.

Year	Location	Effort	Estimated Total Catch				
		(days fished)	Chinook	Coho	Sockeye	Pink	Chum
2004	(A) Ketchikan	92271	14334	63348	913	43934	7103
	(B) Prince of Wales Island	57573	10120	68098	714	12019	1158
	(C) Kake, Petersburg, Wrangell, Stikine	37058	5866	9372	640	1800	575
	(D) Sitka	78318	26443	69083	2301	8099	4574
	(E) Juneau	113106	13332	46306	632	10655	4608
	(F1) Skagway	5976	984	387	0	597	88
	(F2) Haines	13905	853	727	262	2679	132
	(G) Glacier Bay, North Chichagof	37506	3601	26114	759	7655	1982
(H) Yakutat	7315	579	8718	541	81	16	
<i>2004 Total</i>		<i>443028</i>	<i>76112</i>	<i>292153</i>	<i>6762</i>	<i>87519</i>	<i>20236</i>
2005	(A) Ketchikan	87683	16404	71772	1128	32086	4438
	(B) Prince of Wales Island	68468	13615	110914	972	16105	3411
	(C) Kake, Petersburg, Wrangell, Stikine	32547	7351	11611	85	2992	461
	(D) Sitka	84164	26611	96644	1582	12023	1634
	(E) Juneau	118434	13597	54907	1906	10905	2888
	(F1) Skagway	6380	758	201	0	140	18
	(F2) Haines	10421	601	380	0	1734	16
	(G) Glacier Bay, North Chichagof	47473	3343	28176	790	13988	1674
(H) Yakutat	10014	545	8641	848	460	108	
<i>2005 Total</i>		<i>465584</i>	<i>82825</i>	<i>383246</i>	<i>7311</i>	<i>90433</i>	<i>14648</i>
2006	(A) Ketchikan	71421	10021	31190	750	8770	1817
	(B) Prince of Wales Island	58035	12670	43015	834	9330	1283
	(C) Kake, Petersburg, Wrangell, Stikine	41394	8842	3806	712	931	195
	(D) Sitka	86204	34751	48860	1679	4951	1347
	(E) Juneau	90988	10509	37983	507	4509	2858
	(F1) Skagway	4156	765	167	0	40	100
	(F2) Haines	9628	504	403	0	123	65
	(G) Glacier Bay, North Chichagof	39788	3488	15876	844	4509	1291
(H) Yakutat	10134	531	3333	73	54	0	
<i>2006 Total</i>		<i>411748</i>	<i>82081</i>	<i>184633</i>	<i>5399</i>	<i>33217</i>	<i>8956</i>
2007	(A) Ketchikan	76365	11197	45586	1415	32875	6259
	(B) Prince of Wales Island	62607	11633	62653	1178	19425	1644
	(C) Kake, Petersburg, Wrangell, Stikine	39364	8514	5614	176	1604	183
	(D) Sitka	89171	30879	71151	1965	8808	2597
	(E) Juneau	98364	9752	27385	410	6736	3179
	(F1) Skagway	3820	776	122	0	227	32
	(F2) Haines	8326	524	408	13	433	112
	(G) Glacier Bay, North Chichagof	47422	5363	15849	180	8018	1995
(H) Yakutat	9917	611	5576	75	419	0	
<i>2007 Total</i>		<i>435356</i>	<i>79249</i>	<i>234344</i>	<i>5412</i>	<i>78545</i>	<i>16001</i>
2008	(A) Ketchikan	78731	11015	46746	713	24376	1813
	(B) Prince of Wales Island	64647	3894	63184	806	11495	768
	(C) Kake, Petersburg, Wrangell, Stikine	40284	5155	6163	672	1104	44
	(D) Sitka	81744	15337	53167	379	4594	1573
	(E) Juneau	90635	8754	17713	1711	3953	2270
	(F1) Skagway	2717	372	14	0	54	0
	(F2) Haines	4938	63	104	206	139	222
	(G) Glacier Bay, North Chichagof	37180	1671	12022	252	3858	1430
(H) Yakutat	8330	612	4603	340	117	0	
<i>2008 Total</i>		<i>409206</i>	<i>46873</i>	<i>203716</i>	<i>5079</i>	<i>49690</i>	<i>8120</i>
<b>Grand Total</b>		<b>4181068</b>	<b>692856</b>	<b>2590081</b>	<b>73756</b>	<b>685502</b>	<b>153151</b>

The SE Alaska creel survey program has generated harvest statistics for chinook and coho salmon for the past 10 years by conducting direct expansion creel surveys for nine marine boat sport fisheries in Juneau, Ketchikan, Sitka, Petersburg, Wrangell, Gustavus, Elfin Cove, and Yakutat. Harvest, effort, and proportion of released fish are estimated from information collected via stratified random multistage sample surveys. Strata are defined by sample period, type of day (weekday vs. weekend-holiday), time of day, and access location, or some combination thereof. Methods for the creel survey program have been consistent for the past 10 years (Mike Jaenicke, Fisheries Biologist ADF&G, pers. comm.) and are described in detail in ADF&G (2008). The only exception was the addition of chinook salmon genetic sampling which started in 2004. In the past 10 years, 20% of the combined commercial troll and recreational US/Canada Pacific Salmon Treaty harvest quota for chinook salmon (called treaty chinook) has been allocated to the SE Alaska recreational fishery. The scope of the creel and port survey program for SE Alaska has been primarily guided by the commitment to maintain this quota. Hatchery fish originating from hatcheries in SE Alaska do not count against this quota and a comprehensive CWT tagging and recovery program is used to estimate the proportion of hatchery fish relative to the total harvest. In-season estimates are used to project the harvest of coho and treaty chinook. Informal harvest contribution estimates are made bi-weekly throughout the season and formal harvest projections are provided to fishery managers three times during the season coincident with two commercial troll openings and the end of the season. Information from the CWT tagging and recovery program can be also used to identify stock composition for tagged chinook and coho. Records of tag recovery from 1977 to 2009 are available to the public through online reports that can be queried through the ADF&G Coded Wire Tag Laboratory (<http://tagotoweb.adfg.state.ak.us/CWT/reports/>).

The creel survey program also undertakes a number of additional tasks including estimating the age composition of early season chinook salmon, collecting species composition of harvested fish; computing harvest per unit effort (HPUE) for chinook, coho, pink, and chum from catch sample and creel survey data; and collecting genetic tissue samples and corresponding ageing structures from chinook salmon. The genetic stock identification of chinook salmon being harvested by recreational and commercial fisheries in Southeast Alaska is a management tool that is currently being evaluated by the Pacific Salmon Commission (ADF&G 2008).

The saltwater charter logbook program requires that vessel operators and guide anglers fill out and submit to ADF&G a daily trip logbook page. Information includes: areas fished, individual angler license number, residency, and number of salmon caught and released. The logbook program has been consistently collecting this information since the program began in 1998.

This information is used for regulation and the development and management of fisheries, for project evaluation, and for formulation of department policies and priorities that reflect angler needs, concerns, and preferences. It also provides the Alaska Department of Fish and Game (ADF&G) with a tool to promote management of Alaska's resources for sustained yield. Logbook data provides a census of fishing lodge angling activity. In years where the other components of the creel survey are conducted, the log book data is incorporated into the overall harvest estimate.

The statewide harvest survey (SWHS) is an annual mail survey that is used to estimate statewide sportfishing participation and harvest of various fish species from both salt and freshwater recreational fisheries. The SWHS began in 1977 and is described in detail in Jennings *et al.* (2009). The objective of the SWHS is to estimate angler participation, catch, and harvest for Alaska recreational-caught species statewide, by area and by fishery. Data collected through the annual mail surveys is used to fill in information gaps where creel surveys and the logbook program are not administered. Statewide data is also used for formulating a broad range of state-wide policies. The mail survey uses a stratified random design, with targets for estimated participation and harvest of 15% of actual values 95% of the time. A form is mailed out to homes with at least one fishing license holder; the forms are completed and returned to ADF&G. Response rates for the 2006 survey were 42.6% of total households surveyed. A multi-year comparison of the SWHS to harvest data collected from on-site creel surveys showed that the SWHS provided a consistent estimate of recreational harvest (Clark 2009).

## 4. CONCLUSIONS AND RECOMMENDATIONS

### 4.1. Canada

Recreational salmon fishing in Canadian tidal waters occurs mainly in Haida Gwaii and near Prince Rupert, BC and targets mainly coho and chinook salmon. Creel surveys and a lodge logbook reporting program in Haida Gwaii are generally applied consistently from year to year, and the two programs complement each other. For example, the lodge log book program records only the number of salmon harvested, whereas the creel survey includes data that differentiates between catch numbers and harvest numbers. The remote nature of most fishing sites in Haida Gwaii makes monitoring of the recreational fishery a challenge and thus, fisheries managers are dependent on the self reporting provided in the lodge logbook program. Additionally, collecting biological samples from this fishery is logistically difficult and expensive.

The main difficulty with the recreational harvest data we have assembled is that it is not possible to determine what portion of the catch are Skeena River salmon. Stock identification is an expensive and complex science and efforts to determine the stock composition of salmon harvested recreationally on Canada's north coast has been limited to chinook. This problem of stock identification is exacerbated by the fact that the farther away from the Skeena River a fishery occurs, the more mixed the stocks are and also the more logistically difficult and expensive it is to gather biological data (scales or tissues for genetic analysis).

Major genetic and telemetry studies aimed at improving stock identification of Skeena chinook are currently underway (Ivan Winther, DFO North Coast, pers. comm.). The data that has been synthesized so far allowed for estimates of the proportion of Skeena chinook harvested in Areas 3 and 4 in the 2009 recreational season to be reported in the annual creel survey report (van Tongeren and Winther 2010). Further results will generate a more accurate genetic baseline that will enable

stock assessment personnel to complete the analysis and publication of genetic information collected in recent years. Results of the study expected within the next few years.

Stock identification of coho is problematic because site fidelity in the species is generally weak (Ivan Winther, DFO North Coast, pers. comm.). In other words, coho tend to stray from their natal rivers more frequently than other salmon species such as chinook. The result is large variability amongst the DNA collected from spawning fish and this makes the establishment of a quality genetic baseline difficult and expensive, as very large sample sizes are required. Therefore, at this time no effort is underway to identify the stock composition of coho harvested recreationally in fisheries likely to intercept Skeena fish. Accordingly, no scale samples were taken from coho during the 2009 creel survey, and thus no DNA analysis will be performed (van Tongeren and Winther 2010).

The number of sockeye, pink, and chum salmon harvested recreationally in areas that intercept Skeena fish (SE Alaska, Canadian Tidal Areas 1-4, or Non-Tidal fisheries) is very low in comparison to the commercial harvest of these species. The impact of the recreational harvest on escapement of these species is thus considered negligible by fisheries managers (Dave Peacock, DFO North Coast, pers. comm.). The financial and time investment involved in stock identification of these species would be extremely large in comparison to the proportion of the return impacted by the recreational sector. This would be an inefficient use of stock assessment resources from a management perspective. Energy is better spent on efforts to accurately estimate the harvest of fish from the sector with the largest impact; commercial fisheries. As a result, no directed efforts are performed by Fisheries and Oceans Canada to determine the stock composition of sockeye, pink, or chum salmon harvested recreationally in these areas.

The other source of information on stock composition of recreationally harvested salmon is from the coded wire tag program. The CWT information is analyzed every year and the results are shared between Canada (DFO) and the United States. The CWT program is designed mainly to look at the harvest of specific stocks of concern, for example certain Columbia River stocks, rather than to generate overall stock composition estimates. In general, the use of this data for chinook stock identification purposes is focused on the management of those populations where a CWT program is in place at hatcheries and analysis of information by Canada is mandated by the Pacific Salmon Treaty. Sample size of CWT data for fish of Skeena origin is limited and does not provide a basis for robust estimates of stock composition. For example, in 2009 only 33 chinook heads were recovered by creel survey or lodge personnel in Canada from adipose fin clipped salmon (van Tongeren and Winther 2010). Of these heads, 16 yielded data, 4 of which were of Skeena origin (Kincolith and Terrace).

Heads were recovered from 9 adipose fin clipped coho salmon harvested recreationally on the North Coast in 2009, resulting in the analysis of 6 CWTs, 4 of which returned data (van Tongeren and Winther 2010). Of these fish, 1 was Alaskan (Nakat Inlet), 1 was from Washington State (Wells Hatchery, Columbia River), and 2 were from Toboggan Creek Hatchery on the Bulkley River (Skeena).

Secondary to the problem with stock identification, we uncovered inconsistency in how fishing effort is estimated or defined between surveys. A variety of different units are reported: angler hours, angler days, and boat days, for example. This fact introduces further uncertainty in estimates of total harvest and makes it difficult to compare effort between years or locations. It is recommended that the unit of effort be clearly defined or perhaps standardized.

In-river creel surveys tend to be focused on a particular species of interest, usually that targeted for retention during the opening. In most cases, the target is chinook, coho or sockeye salmon. Frequently, few or no data on the estimated harvest of non-target species (pink or chum salmon) are reported, though catch numbers, when reported, indicated that these species are in fact encountered by recreational fishers. Few of the pink and chum salmon captured by anglers in-river are retained, probably because anglers prefer to consume the other species: better reporting would clarify the situation.

Data presented in creel reports are in a wide range of formats and it is sometimes unclear whether the reported estimates are of total catch (encountered) or of the total number of fish harvested (retained). In many cases, the terms “harvest” and “catch” are used interchangeably, leading to uncertainty about which data are reported. Harvest estimates alone may not be the most appropriate measure for quantifying the impact of the recreational salmon fishery on populations of salmon in the Skeena River, as catch and release induces mortality. Reported mortality rates associated with catch and release fisheries vary widely, and are difficult to predict, and vary by species, proximity to fresh water, angler experience and education, water temperature, and a multitude of other factors. In order to properly gauge the impact of the recreational fishery, it is important to consider the number of fish released and apply an estimate of mortality rate to those fish to be added to the total harvest numbers. The 1999 Lower Skeena Creel Survey (J.O. Thomas & Assoc., 1999) reported the condition at release for a subset of fish encountered. For the Lower Skeena River recreational Chinook fishery, the estimated mortality rates of released fish were: Chinook 54%, Coho 4%, Sockeye 8%, Pink 33%, and Steelhead 8%. During the recreational Pink fishery estimates were: Chinook 28.6%, Coho 1%, and Pink 7.9%. In consideration of this, the total number of fish encountered and released should be better reported in creel surveys and log book reporting programs for recreational salmon fisheries.

The development of a reporting framework with clearly defined deliverables will improve the usefulness of creel reporting to fisheries managers. Workshops for contractors and FN communities would provide an opportunity for dialogue on management needs and facilitate community based solutions specific to the fishery and location. The imposition of a single standard creel survey format is not recommended because each monitoring situation is unique and best served by a tailored solution. However, the formats must provide the same basic standardized information.

Currently it is time consuming to transform creel information into the format most useful fisheries managers, which is the total estimated number of fish caught and the estimated number harvested, by species, for the duration of the recreational opening. The creation of a centralized database or website for recreational harvest data and reports would be beneficial. A good framework would be

the web-based format used in by the Alaska Department of Fish and Game (<http://www.sf.adfg.state.ak.us/Statewide/FishingSurvey/>). Preferably, this measure would also come with clear associated confidence intervals.

#### 4.2. Alaska

The major limitation of the data from SE Alaska pertains to stock identification needs. With no stock identification program in place for coho, sockeye, pink, or chum salmon harvested recreationally in Canada, it not possible to investigate the stock composition of these species of salmon caught in SE Alaska. The summer recreational fishery in SE Alaska doesn't intercept Skeena chinook as these fish are no longer in the area; they are farther south, closer to the Skeena River (Ivan Winther, DFO North Coast, pers. comm.) The off-season (winter up to May) fishery would be more likely to intercept Skeena chinook. When the ongoing genetic studies of Skeena chinook are completed, it will be possible to investigate the proportion of Skeena River chinook captured in this fishery. Until this work is completed, it is simply not possible to estimate the proportion of the total recreational harvest in SE Alaska that is comprised of Skeena chinook.

The management program administered by the Alaska Department of Fish and Game in SE Alaska provides robust and consistent recreational harvest monitoring. The multi-level design of the program, using creel and port surveys, saltwater charter logbooks, and statewide harvest annual mail surveys allows for overlap of reporting methodologies and strengthened harvest estimates. Stock composition can be estimated based on CWT recovery programs, and genetic information collected during the creel and port surveys may provide a means for better estimating stock composition in the future.

The reporting framework for recreational catch monitoring in Alaska is efficient and accessible. Data is accessible to all interested parties and updated on an annual basis. The ADF&G publishes recreational harvest data in a centralized database, which is accessible to the public through a website (<http://www.sf.adfg.state.ak.us/Statewide/FishingSurvey/>). The website contains links to Alaskan recreational catch and harvest data from 1977 to nearly present date, by location. Additional historical harvest data is also available for the years 1977-1990. The information is clear, centralized, up-to-date, and readily accessible to the public. In addition, annual reports are completed by F&G staff and can be accessed in PDF form. The Alaskan program provides a template for effective recreational harvest monitoring.

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