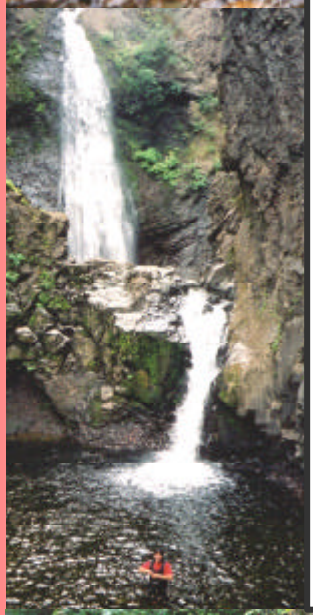
Appendix R – 2002 Babine Lake Tributary Juvenile Coho Assessment Program





2002 Babine Lake Tributary Juvenile Coho Assessment Program







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NED'U'TEN FISHERIES 2002, 2003

2002 Babine Lake Tributary Juvenile Coho Assessment Program

Prepared For:
Fisheries and Oceans Canada
Stock Assessment
Prince Rupert, BC

March, 2003

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2	Data forms for recording; 1) specific spatial and temporal information with respect

to the site being surveyed, 2) catch information for removal- depletion results, 3) an example map showing habitat features required to be documented and specific physical measurements required.

3 Summary of qualitative observations made during ground surveys of Babine Lake tributaries that possessed insufficient habitat to conduct quantitative surveys.

4 Digital data forms relating to all sites sampled in 2002 where coho were captured.

EXECUTIVE SUMMARY

The fisheries program of the Lake Babine Nation undertook a survey of the presence and density of juvenile coho within tributaries to Babine Lake in 2002. From August 28 to October 11 a total of 26 sites on 19 streams were assessed utilizing either visual assessments, random open site minnow trapping or multiple pass closed site removal-depletion minnow trapping surveys. Sites were selected based on previous works completed, of which 2002 efforts were intended to continue. Additional (i.e. previously unsampled) sites for sampling were selected based on habitat suitability. Information pertaining to the habitat conditions at each site sampled and the number of coho and other species captured at each site were collected and recorded. Morphological information was collected from all coho captured and aging structures were removed from a subsample. Data from multiple pass minnow trapping surveys was evaluated to estimate juvenile coho density.

Due to a number of contributing factors, including the late season timing of adult coho returning to the Skeena and Babine systems and related inclement weather conditions, and their typical use of very small spawning streams, estimations of coho escapement can be notoriously difficult and ineffectual. Contributing to the difficulty in obtaining accurate escapement information is coho's tendency to be widely distributed throughout the Skeena watershed, with the least amount of concentration into few productive habitats and/or stocks, relative to the other salmon species in the Skeena. These factors have contributed to the development and use of only 2-4 coho stocks for use as indices of Skeena coho stock health, due to the high costs and implications associated with fence, tagging and/or hatchery programs. In order to develop a more cost effective approach to assess and monitor coho population levels, which could therefore be applied to a broader range of Skeena coho producing systems, the Skeena Green Plan Synoptic Juvenile Coho Sampling Program was initiated in 1994. This program involved the annual assessment of juvenile coho densities from a number of established sites within the Skeena watershed, including several tributaries to Babine Lake. This work was annually conducted from 1994-2001. The work conducted by the Lake Babine Nation in 2002 was a continuation of this work in the Babine watershed.

Coho were the most numerous and frequently captured species at sites sampled. Estimated juvenile coho densities ranged from 0.01 to a high of 3.47 coho/m^2 of wetted stream channel. Substantial densities of juvenile coho (i.e. greater than 0.5 coho/m^2) were determined at 7 sites in 5 streams, including Tachek, Gullwing/ Sixmile, Bernan, Sockeye and Cross creeks. Sampling within the Sutherland River yielded very high rudimentary estimates of juvenile coho density, and habitat potential also appeared very high. Qualitative visual estimates of streams possessing very marginal, intermittent habitat also appeared to indicate juvenile coho presence in many of these streams.

INTRODUCTION

Study Area

The Skeena River watershed (54,432km^2) is the second largest watershed within B.C. and supports populations of all six pacific salmon species. These salmon populations supported by the Skeena River include annual escapements of sockeye salmon (*Oncorhychus nerka*) that consistently number in the millions. Ninety-nine percent of the sockeye production to the Skeena River watershed originates from 8 stocks utilizing natal habitats within the Morice (Morice and Nanika rivers), Bear , Kispiox, Zymoetz, Lakelse, Kitsumkalum and Gitnadoix watersheds and the Babine watershed (Pinkut and Fulton creeks and approximately 25 other populations) (Gottesfeld et al. 2002). Over the last several decades the Babine River watershed sockeye have annually contributed 90% or more of this total Skeena River sockeye escapement (McKinnell and Rutherford 1994). Babine's large contribution to the Skeena sockeye production is in part owing to two large-scale enhancement projects on Babine Lake, the Pinkut Creek and Fulton River spawning channels. Coho production within the Skeena watershed is the most widely distributed of any of the six salmon species occurring in the watershed. The top coho producing sub-basins of the Skeena include the Morice, Babine, Kispiox, Lakelse, Gitnadoix, Ecstall, and Kalum rivers, as identified from the SEDS database by Gottesfeld et al. (2002).

The Babine River watershed (10,477km^2) is the largest sub-basin tributary to the Skeena River. Upstream of the 96km mainstem length of the Babine River the largest naturally occurring lake in B.C., Babine Lake (surface area 461km^2) provides the river's source (Gottesfeld et al. 2002)(Figure 1). Babine Lake is the largest sockeye rearing lake in B.C. and is considered highly productive for a lake of its size (Stockner and Shortreed 1976). The Babine watershed supports populations of all six pacific salmon, although chum return in very small numbers. As indicated above, the largest stocks that enter the lake are the sockeye stocks that return to Pinkut Creek and the Fulton River spawning channel operations, as well as wild sockeye stocks that spawn in approximately 25 other spawning areas/tributaries. The Babine River supports substantial stocks of coho, chinook, pinks, and is world renowned for its steelhead population. Coho stocks are known to be significant in number, as counts of adult coho are obtained from the Babine River sockeye counting fence on an annual basis and have been collected since 1951. However, terminal enumeration and assessment activities have not been undertaken with respect to the Babine Lake coho stocks, with the exception of the Morrison River. Their use of Babine Lake tributaries is known but poorly understood and the decline of the Babine coho stock(s), as measured via annual fence counts, has been well documented throughout the last 30 years (DFO 1999).

Background

Coho populations of the Skeena watershed have been in a trend of decline for several decades due to high rates of exploitation in Alaska and B.C. fisheries, declining ocean survival, and habitat degradation (Gottesfeld et al. 2002). Overall exploitation rates in southeast Alaska and northern B.C. coastal commercial fisheries for three Skeena/North Coast coho index stocks ranged from 30-90% for the period 1985-1998, and were consistently in the range of 65-70% (Holtby et al. 1999). These rates of exploitation and the corresponding severity to which some Skeena coho stocks had been depressed led to the implementation of substantial changes to the commercial and sport fisheries in 1998 and 1999 in order to reduce exploitation. Compounding this issue is the poorly developed nature of escapement information relating to many of the coho stocks within the Skeena watershed.

Due to the late season timing of many coho stocks within the Skeena watershed and the inclement weather and climate conditions that are experienced at the time of their return to the locations of their natal streams, estimates of adult escapement are logistically difficult and therefore poorly documented. In addition, due to the nature of the small and/or headwater stream habitats that coho prefer to utilize for spawning, aerial estimations of escapement are not possible and ground surveys can be notoriously difficult and ineffectual. Contributing to the difficulty in obtaining accurate escapement information is the Skeena coho stocks' tendency to be widely distributed within the watershed, with the least amount of concentration into few productive stocks and/or habitats, relative to other Skeena salmon species. These factors have contributed to the development and use of only 2-4 coho stocks for use as indices of Skeena coho stock health and exploitation, due to the high costs and implications associated with fence, tagging and/or hatchery programs that are required to develop an indicator stock. The stocks and methodologies utilized to develop indices of coho escapement to the Skeena, and/or various sources of exploitation on Skeena stocks, include the Fort Babine and Toboggan Creek Hatchery programs, which release marked coho that can be detected in various fisheries, the Tyee Test Fishery, which provides an index of coho abundance, and the Babine River fence which provides partial counts of the Babine/Nilkitkwa coho stocks.

The in-river Tyee Test Fishery provides indexed daily estimates of species-specific abundance. This test fishery is only conducted until August 31, well before the completion of the entry of many coho stocks into the Skeena, and it therefore cannot be utilized as an estimator of the overall annual Skeena coho

escapement (Appendix 1). In addition, a counting fence on Buck Creek (upper Bulkley River tributary) has been operated during some years and provides an indicator of stock abundance trends. Also, as previously discussed, coded wire tagging programs on hatchery coho stocks from the Fort Babine (Babine stock) and Toboggan Creek (Bulkley River tributary) SEP facilities allow for accurate estimations of marine survival and exploitation on two Skeena coho stocks. Also as referred to above, information relating to adult coho salmon escapements into Babine Lake is collected in conjunction with other information, mainly adult sockeye escapement, on an annual basis from the adult counting weir located at the Babine River outlet from Nilkitkwa Lake (Appendix 1). However, due to the conclusion of the sockeye run and the onset of inclement fall/winter conditions in October, the operation of the weir was historically terminated from mid-late October. Since 1997, attempts have been made to continue the operation of the weir until mid-late November. Due to the late timing of coho entering the Babine Lake system, the coho escapement information collected from the fence prior to 1997 has normally been incomplete. From 1997-2001, the prolonged operation of the fence has more completely enumerated coho escapement into the Babine Lake system. Coho escapement has also been relatively thoroughly quantified in a number of years via fence counts in Morrison Creek, a major tributary to Babine Lake

In an effort to provide a cost effective and more thoroughly applicable method to assess and monitor coho population levels within the Skeena River watershed, DFO initiated the Skeena Green Plan Synoptic Juvenile Coho Salmon Program in 1994. This program continued from 1994-2001 and included the annual sampling of more than 40 sites on many streams throughout the watershed. This sampling involved the collection of fish and habitat information from established sites utilizing standardized and feasibly replicated methodologies to annually monitor spatial and temporal trends in, principally, juvenile coho, and also chinook and steelhead presence, use and abundance. The intention was that, through the collection of several years of this information, the resultant data would assist in an appraisal of habitat utilization, and in combination with coho escapement estimates and trends provided through the established means discussed above, provide an indicator of habitat productive potential as well (Taylor 1996).

The work conducted from 1994-2001 included the sampling of numerous tributaries to Babine Lake to assess juvenile coho use and density. Babine Lake tributaries that were previously sampled included Nilkitkwa Lake (1 site), Boucher C. (2 sites), Lamprey C. (1 site), Morrison R. (2 sites), Nine Mile C. (1 site),

Sutherland R. (1 site) and Tachek C. (1 site) (Taylor 1996). In 2002, Lake Babine Nation, with funding provided by DFO, continued the collection of this juvenile coho information in the Babine lakeshed, and where requested by DFO, expanded this program to other tributaries to the lake.

Purpose

The overall purpose of the Skeena Green Plan Juvenile Sampling Program, as well as the specific purposes of the juvenile coho sampling program undertaken in the Babine watershed 2002, can be summated as follows:

1. To determine the extent of distribution of coho salmon usage and abundance in tributaries to Babine Lake. Also, over several years of these surveys, in combination with adult escapement data from the Tyee Test Fishery and the Babine Fence, to determine the capability of Babine Lake tributaries to produce coho. The premises of this sampling strategy are as follows:

   - Juvenile coho generally stay within their natal stream (i.e. the stream in which they were spawned) for two years. Age 0+ coho presence within a stream generally indicates the past presence of adult spawning activity.

   - The number/density of age 0+ coho juveniles documented within a stream in August-September may be an indicator of the number of adults that spawned in the stream the previous fall.

   - The presence, density and characteristics of age 0+ coho juveniles in a range of streams and habitats originating from a range of adult coho escapements will provide an indicator of the system's coho production capability and stock status.

2. To provide Canadian (DFO) commercial fisheries managers with information, which they presently do not have, relating to creating a scientifically and ecologically based escapement target for Babine Lake coho stocks.

METHODS

Twenty sites on 13 streams were quantitatively assessed for juvenile coho presence and density utilizing baited minnow traps to trap fish and/or complete multiple pass removal-depletion estimates. Site locations were selected to include those sampled in previous years of this assessment program, as well as others that were assessed to have the potential to contain sufficient habitat to implement

the necessary trapping methodologies. Site locations were geo-referenced utilizing a handheld GPS and site boundaries were marked with flagging tape. Sampling was conducted by a single crew of two-three persons.

In addition, a total of 6 streams were qualitatively assessed via a combination of walking and visually assessing available/suitable habitats for juvenile coho presence. These surveys were limited to those Babine Lake tributaries that were encountered that were ephemeral and/or intermittent and therefore did not possess sufficient habitat to allow for performing a quantitative assessment.

Site Selection

The selection of streams to be sampled was somewhat predetermined to include those that had been sampled in previous years of this program. This was with the intent to allow for a comparative assessment of juvenile coho densities observed within specific habitat units over a series of years to correlate know information with respect to adult escapement to subsequent juvenile production. In addition, the intent in 2002 was to expand this sampling program to tributaries to Babine Lake that had not previously been sampled for coho, adding to information on adult coho use and distribution within the system. A general data form, as per Appendix 2, was completed for all sites selected for sampling.

Sites within tributary streams were selected to include a 20-50meter length of representative stream habitat that contained cover units that would serve as juvenile coho rearing habitat. This generally included deep-pool or undercut habitats in combination with abundant LWD. Sites were normally stop-netted off at their upstream and downstream boundaries to ensure the absence of immigration/emigration into/out of the site during the survey.

Fish Capture/Collection

Baited minnow traps were utilized to attract and capture all fish species within each site. Salted sockeye roe (from the Lake Babine Nation food fishery) was consistently utilized. Quarter-sized pieces of bait were placed in each trap. Upon the assembly and baiting of traps, they were placed within the chosen site with the highest density of traps at the best habitats within the site. The time, number and location of traps were noted upon the deployment of the final trap. After one hour had passed, traps were checked, fish captured were placed in a holding bucket and all traps were rebaited and replaced in their original location. The time of this 2nd deployment was recorded. All fish from this 1st pass of sampling were held within the same container and processed during the one-hour waiting period between the second checking of traps. This process was generally completed

twice to complete 3 one-hour passes of sampling. If no coho were captured on a pass, no further passes were completed. If the number of coho captured increased or matched the number captured on the previous pass, an additional pass of sampling effort was completed.

This capture methodology is size limiting in terms of the size/age of fish captured, due to the aperture diameters at either end of the trap which allow fish access. However, the purpose of the surveys (i.e. capture of juvenile coho), made this bias irrelevant to the intended result.

Fish Sampling

All fish captured were anaesthetized utilizing clove oil. Fish processing took place at a location on the stream slightly downstream of the sampling site to avoid disturbance of the site and/or accidental release of fish into the site. A recovery bucket was anchored midstream to allow the stream's flow to continuously flush freshwater through the bucket, which was perforated with numerous small holes. A pail for anaesthetizing fish was prepared and fish from the first pass were gradually transferred from the holding bucket to the anesthetic solution (20-30 fish at a time). All fish other than coho were identified to species (genus in the case of cottids), tallied and placed in the recovery bucket anchored midstream. All coho captured were measured for fork length and a sub-sample of the coho captured were weighed and scales were collected for later age determination. This process was subsequently repeated for fish captured on each pass of minnow trapping effort. The anesthetic solution was replaced after fish from each pass were processed and/or sooner if many fish were being captured and subsequently processed. All fish collected and processed from all passes were accumulated in the recovery bucket. At the completion of the sampling procedure the recovery bucket was emptied at the top of the sampled site, after stop-nets were removed and all habitat measurements were collected so the site would no longer be disturbed, to allow fish to redistribute through the site. All data pertaining to fish captured during a survey were recorded on a data form as per Appendix 1.

Habitat Assessment/Measurement

In order to allow for an assessment of juvenile coho density within and between sites, sites sampled via the means of removal-depletion estimates were measured to obtain total site length, average channel width, wetted width, and wetted width > 10cm of depth. Total site length was measured from the upstream boundary of the site to the downstream boundary of the site along the thalweg of the channel within the site. Width measurements were collected at a minimum of 5 locations evenly distributed through the length of the site. A descriptive map of each site was

constructed including major cover features and locations of all traps within the site. UTM coordinates of the site were collected with a handheld GPS unit and the upstream and downstream boundaries of the site were flagged with pink flagging. Conductivity, pH and water temperature were collected at most sites. An example of one of these maps with the required habitat features and physical measurements documented is provided in Appendix 1.

Coho Density Estimates

The density of coho juveniles observed at each of the sites sampled via a removal-depletion survey were calculated using the Leslie-Zippen Method, as supplied in an excel spreadsheet format by DFO. This statistical analysis and the associated spreadsheet calculates density estimates by site length, by square meter of wetted channel area and by square meter of wetted channel area > 10cm of depth.

RESULTS

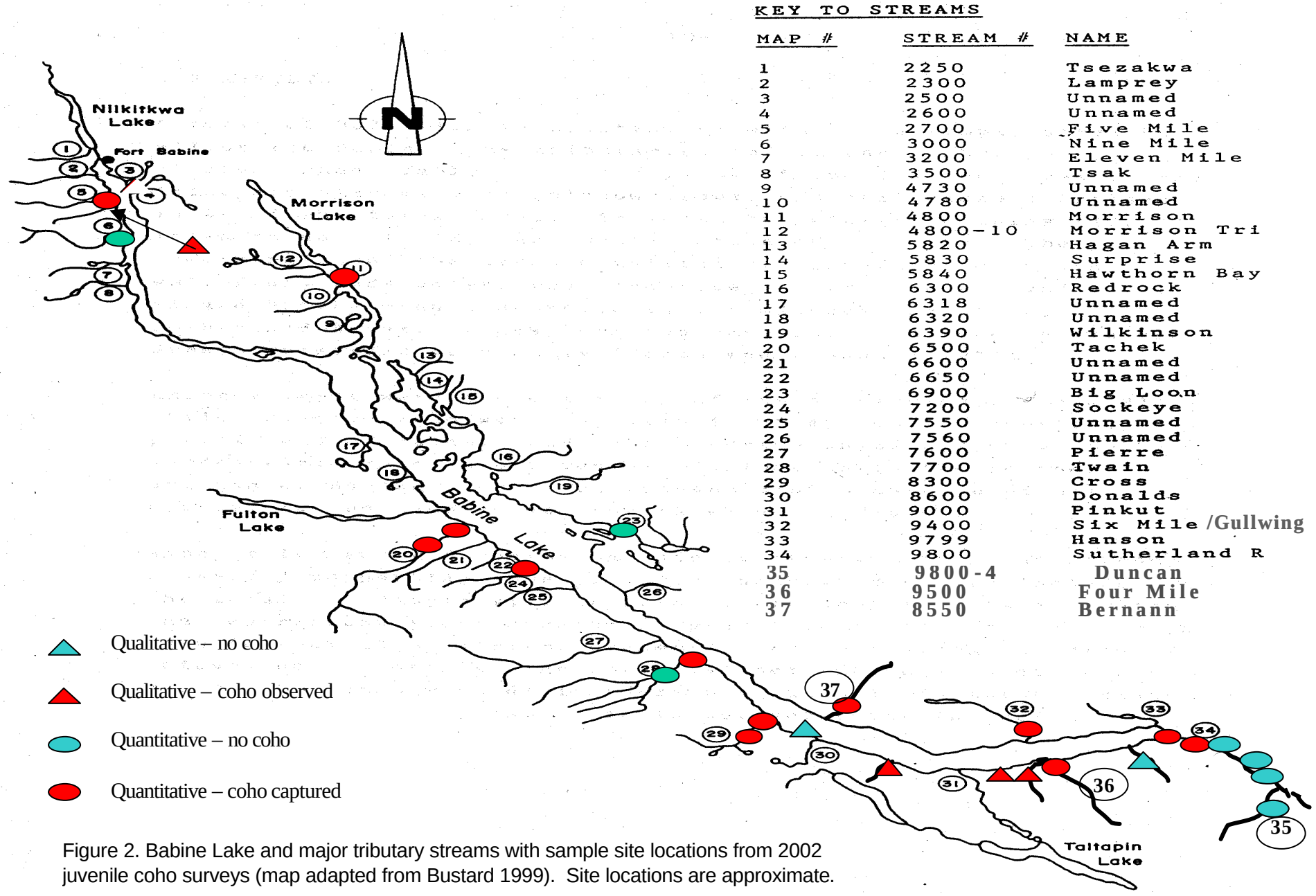
Sampling Summary

A total of 20 removal-depletion or fish trapping surveys were attempted in 13 streams tributary to Babine Lake in 2002. The streams, dates of sampling, and information relating to the location of each stream and site are presented in Table 1. Approximate locations are provided in Figure 2.

An additional 6 streams were assessed visually via ground surveys for juvenile coho presence and potential coho spawning habitat and/or juvenile rearing potential. The streams that were surveyed in this manner and related information observed is presented in Appendix 3. The locations of qualitative surveys on these streams are also approximated in Figure 2.

Fish Captures

Catch information from the 20 sites where removal-depletion and/or fish trapping surveys were completed are presented in table 2. Coho were the most frequently captured species, followed by cottidae species and rainbow trout. No other species were captured. Coho were also the most commonly captured species, being captured at 13 of 20 sites sampled, followed by rainbow trout and cottidae species (Table 2).



KEY TO STREAMS

MAP #	STREAM #	NAME
1	2250	Tsezakwa
2	2300	Lamprey
3	2500	Unnamed
4	2600	Unnamed
5	2700	Five Mile
6	3000	Nine Mile
7	3200	Eleven Mile
8	3500	Tsak
9	4730	Unnamed
10	4780	Unnamed
11	4800	Morrison
12	4800-10	Morrison Tri
13	5820	Hagan Arm
14	5830	Surprise
15	5840	Hawthorn Bay
16	6300	Redrock
17	6318	Unnamed
18	6320	Unnamed
19	6390	Wilkinson
20	6500	Tachek
21	6600	Unnamed
22	6650	Unnamed
23	6900	Big Loon
24	7200	Sockeye
25	7550	Unnamed
26	7560	Unnamed
27	7600	Pierre
28	7700	Twain
29	8300	Cross
30	8600	Donalds
31	9000	Pinkut
32	9400	Six Mile /Gullwing
33	9799	Hanson
34	9800	Sutherland R
35	9800-4	Duncan
36	9500	Four Mile
37	8550	Bernann

Figure 2. Babine Lake and major tributary streams with sample site locations from 2002 juvenile coho surveys (map adapted from Bustard 1999). Site locations are approximate.

Table 1. Babine Lake tributaries and related site locations that were assessed for juvenile coho presence and density in 2002.

*Fig. 2 Map No.	Stream	Site No.	Date	Zone	Easting	Northing	Description
34	Sutherland	5	Oct-01	10	380652	6022901	Located approximately 80m downstream from Sutherland FSR crossing of stream.
34	Sutherland	4	Oct-01	10	380423	6022968	Approximately 120m downstream from site 5.
34	Sutherland	3	Oct-01	10	378249	6026386	Accessed from Sutherland FSR extension beyond stream crossing for 9.0km and 500m walk to stream.
34	Sutherland	2	Sep-27	10	359516	6039765	Several hundred meters upstream of site 1 on left bank of Sutherland mainstem.
34	Sutherland	1	Sep-27	10	359308	6039930	Site is completed in first 20m of sidechannel off right bank that serves as the junction of tributary stream.
35	Duncan	1	Sep-30	10	381608	6017146	Site is approximately 20m downstream of Sutherland FSR crossing of the stream.
36	Fourmile	1	Sep-17	10	349642	6037222	Located approximately 100m upstream from Babine Lake.
32	Gullwing/ Sixmile	1	Sep-11	10	346785	6040214	Approximately 140m upstream from Babine Lake.
37	Bernann	1	Sep-12	10	346783	6040218	Located 100m upstream from Babine Lake,
29	Cross	1	Sep-10	10	324878	6044098	Site located approximately 10m downstream of site 2.
29	Cross	2	Aug-30	10	324881	6044086	Located directly behind abandoned homestead where stream crew normally initiates surveys.
28	Twain	1	Sep-18	10	318234	6054882	Approximately 400m upstream from lake.
28	Twain	2	Sep-18	10	318193	6054827	Located 40m upstream from site 1.
24	Sockeye	1	Oct-01	10	692196	6069429	Located approximately 200m upstream from Babine Lake.
23	Bigloon	1	Oct-04	10			Approximately 100m upstream from mouth.
20	Tachek	1	Aug-29	10	684644	6074954	Located approximately 100m downstream of road crossing.
20	Tachek	2	Aug-28	10	684628	6074821	Located approximately 100m upstream of road crossing.
11	Morrison	1	Oct-03	10			Site completed on right and left stream margins immediately below road crossing.
6	Ninemile	1	Oct-11	10	653860	6120610	Located approximately 150m upstream from Babine Lake.
5	Fivemile	1	Oct-08	10	652622	6125761	Located approximately 200m upstream from Babine Lake.

Refers to the "Key To Streams Map #" referenced in figure 2.

Table 2. Summary of numbers of fish species captured at each of the Babine Lake tributaries in which traps were deployed in 2002.

*Fig. 2 Map No.	Stream/Site	No. Passes	No. Coho	No. RB	No. Cott.	Total No. Fish
34	Sutherland5	1	0	0	0	0
34	Sutherland4	1	0	0	0	0
34	Sutherland3	1	0	1	0	1
34	Sutherland2	1	14	0	11	25
34	Sutherland1	1	65	0	0	65
35	Duncan1	1	0	6	0	6
36	Fourmile1	2	1	1	0	2
32	Gullwing/Sixmile1	4	156	12	77	245
37	Bernann1	3	223	1	49	273
29	Cross1	3	38	31	20	89
29	Cross2	3	83	23	41	147
28	Twain1	3	22	0	0	22
28	Twain2	1	0	0	0	0
24	Sockeye1	3	160	1	12	173
23	Bigloon1	1	0	0	1	1
20	Tachek1	3	284	6	6	296
20	Tachek2	3	312	5	0	317
11	Morrison1	2	2	1	0	3
6	Ninemile1	1	0	0	0	0
5	Fivemile1	2	9	0	2	11
	Total		1369	88	219	1676
	No. Sites Sp. Capt.		13	11	9	16

Refers to the "Key To Streams Map #" referenced in figure 2.

Coho Presence and Density

As indicated above and documented in figure 2, juvenile coho were found to be widely distributed throughout tributaries to Babine Lake. Observed juvenile coho densities calculated utilizing Leslie-Zippen Method ranged from 0.01 to a high of 3.47 coho/m^2 of wetted stream channel within the sites sampled (Table 3). Substantial densities of juvenile coho (i.e. greater than 0.5 coho/m^2) were determined at 7 sites in 5 streams, including Tachek, Gullwing/Sixmile, Bernan, Sockeye and Cross creeks (Table 3). Figure 3 presents the coho densities observed in 2002 in three formats related to the habitats sampled.

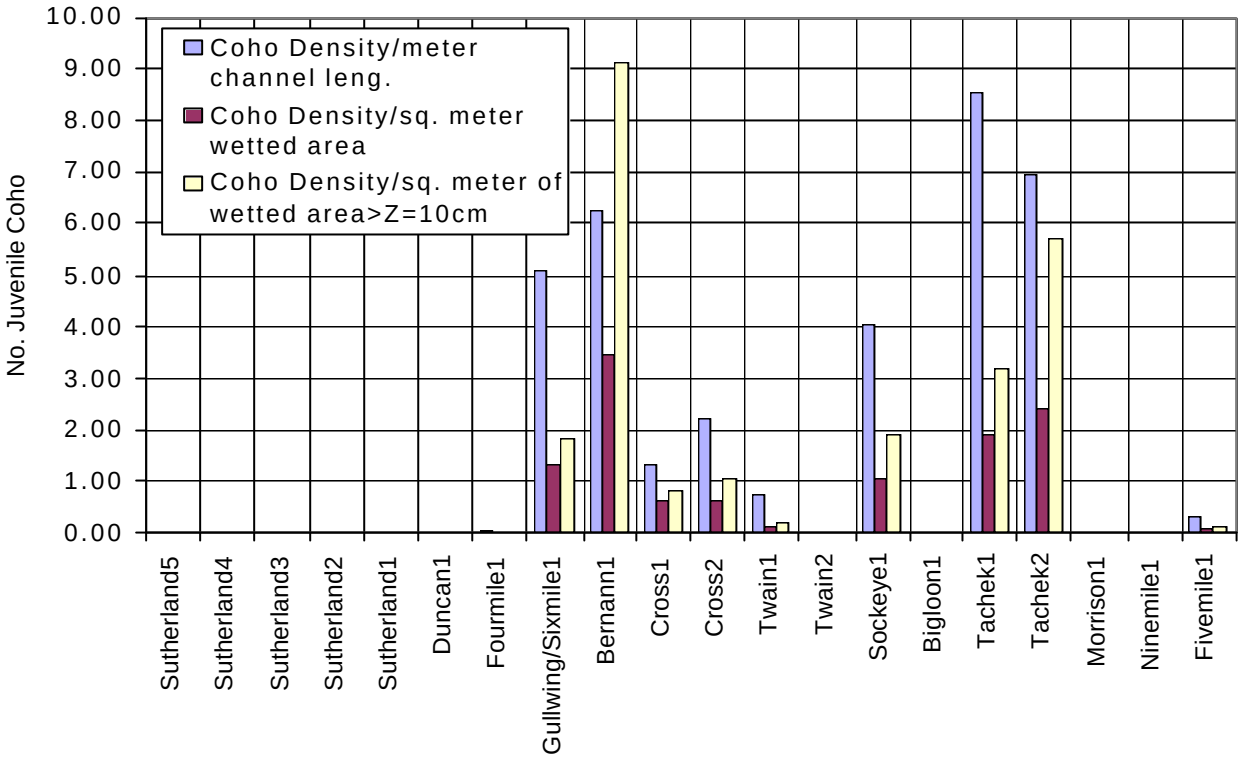


Figure 3. Densities of juvenile coho observed in Babine Lake tributaries in 2002. Sutherland sites where coho were captured are excluded from this figure.

Sutherland River

The Sutherland River, which discharges into the upper/eastern most end of Babine Lake, was sampled at 5 locations in 2002. Other than Bustard's (1989) survey of this sub-basin for the purposes of assessing rainbow trout use and potential, few fisheries related assessments have been attempted in this watershed. The logistical constraints related to sampling within this watershed include very difficult access, due to the remoteness of the area, and the extensive wetland/swamp setting and tortuous-meandering, slough like morphology that is maintained by the lower 25km of the system. The lower portions of the Sutherland River, up to a point approximately 5km from Babine Lake, was accessed by boat from the lake in 2002. Two sites (1 and 2) were completed within this area of the stream. This portion of the stream, and for many kilometers upstream of this point, maintains a slough like morphology with very steep banks vegetated largely by deciduous species, and possesses a channel depth that is nearly consistent across the channel at depths from 2-5meters.

Table 3. Numbers of coho captured at each site and corresponding density estimates (where possible) calculated using the Leslie-Zippen Method, with the exception of those estimated for the Sutherland River, sites 1 and 2.

*Fig. 2 Map No.	Stream/Site	No. P1	No. P2	No. P3	No. P4	No. Passes	EST'D NUMBER (N_{est})	STAND. ERROR of N_{est}	REACH LENGTH (m)	TOTAL AREA (At) (sq. m)	AREA >10cm deep(A_{10})	DENSITY by Length	DENSITY by A_t	DENSITY by A_{10}
34	Sutherland5	0				1	0.00	0.00				#DIV/0!	#DIV/0!	#DIV/0!
34	Sutherland4	0				1	0.00	0.00				#DIV/0!	#DIV/0!	#DIV/0!
34	Sutherland3	0				1	0.00	0.00				#DIV/0!	#DIV/0!	#DIV/0!
34	Sutherland2	14				1	0.00	0.00				#DIV/0!	#DIV/0!	#DIV/0!
34	Sutherland1	65				1	0.00	0.00				#DIV/0!	#DIV/0!	#DIV/0!
35	Duncan1	0				1	0.00	0.00				#DIV/0!	#DIV/0!	#DIV/0!
36	Fourmile1	1	0			2	1.00	0.00	32.40	149.40	119.10	0.03	0.01	0.01
32	Gullwing/Sixmile1	98	27	27	4	4	161.01	3.00	31.50	123.80	87.80	5.11	1.30	1.83
37	Bernann1	182	33	8		3	224.66	1.46	36.00	64.80	24.60	6.24	3.47	9.13
29	Cross1	25	10	3		3	39.94	2.10	30.00	63.90	50.60	1.33	0.62	0.79
29	Cross2	57	17	9		3	87.25	3.12	39.40	139.90	84.20	2.21	0.62	1.04
28	Twain1	18	4	0		3	22.10	0.34	30.50	168.90	122.40	0.72	0.13	0.18
28	Twain2	0				1	0.00	0.00	38.00	203.60	142.80	0.00	0.00	0.00
24	Sockeye1	107	38	15		3	168.40	4.32	42.00	159.60	88.20	4.01	1.06	1.91
23	Bigloon1	0				1	0.00	0.00				#DIV/0!	#DIV/0!	#DIV/0!
20	Tachek1	156	93	35		3	325.24	13.46	38.00	171.00	102.60	8.56	1.90	3.17
20	Tachek2	167	109	36		3	359.14	14.02	51.50	150.00	63.10	6.97	2.39	5.69
11	Morrison1	0	2			2	#REF!	#REF!				#REF!	#REF!	#REF!
6	Ninemile1	0				1	0.00	0.00				#DIV/0!	#DIV/0!	#DIV/0!
5	Fivemile1	9	0			2	9.00	0.00	30.00	123.00	72.00	0.30	0.07	0.13

Refers to the "Key To Streams Map #" referenced in figure 2.

Substrate was 100% fines and was largely fine silt and organic material. The characteristics of the stream in this area made it impossible to complete an enclosed multiple pass removal and a number of baited minnow traps were affixed with longer retrieval lines and deployed in two areas in association with shoreline habitats. These traps were checked after one hour and determined to have the number of fish as presented in table 3. Due to the size and nature of the habitat being sampled, it was determined that there was likely no value in redeploying traps to attempt a removal depletion estimate.

In order to quantify these results into a plausible estimate of density, the number of coho captured per trap deployed during the first pass of the other multiple pass surveys completed in 2002 was plotted relative to the final estimate of density that was derived at each of these sites from a closed site-removal depletion (Figure 4).

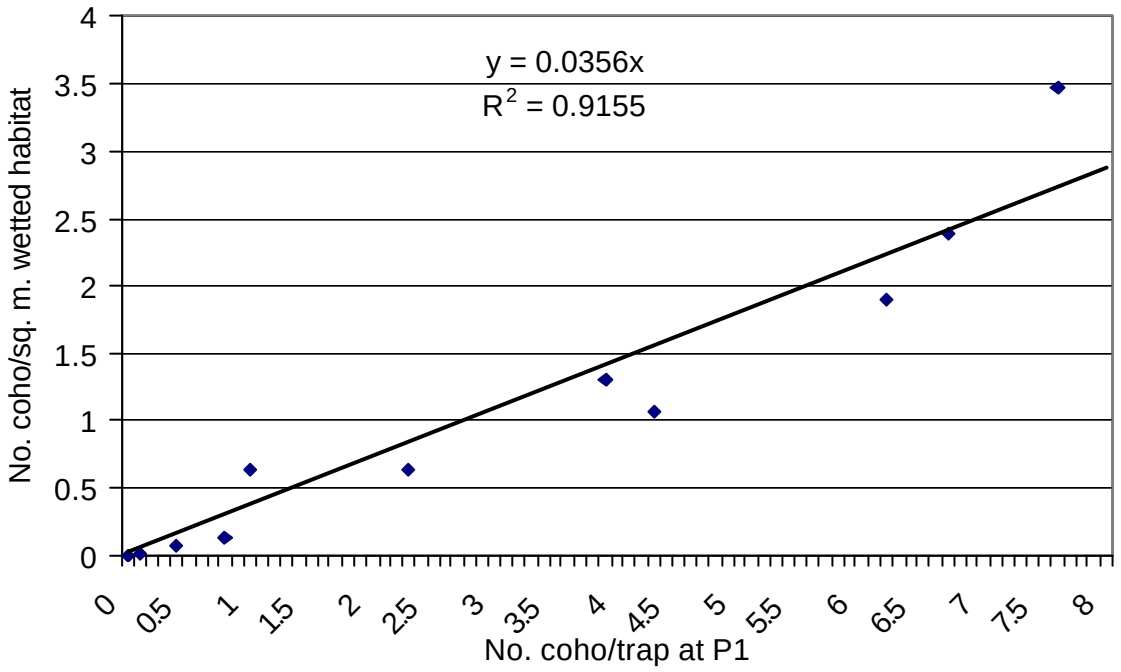


Figure 4. Plot of the number of juvenile coho captured per trap deployed in each of the 11 closed site multiple pass removal-depletion surveys completed in 2002 (as per Table 3 above) relative to the final estimate of juvenile coho density per square meter of wetted habitat, as calculated via the Leslie-Zippen Method.

As can be observed in figure 4, the plotted relationship produces a relatively strong correlation. Utilizing the resultant equation, the density (i.e. number of juvenile coho per square meter of wetted habitat) is estimated at 7.7 and 0.4 coho/m^2 within site 1 and 2 in the Sutherland River, respectively. This disparity likely

reflects the off-channel nature of site 1 and the mainstem stream margin nature of the location of site 2.

An additional 3 sites were sampled within the Sutherland River mainstem, a considerable distance upstream from the locations of sites 1 and 2. The stream channel setting and morphology changes considerably approximately 25 river kms upstream from Babine Lake, where riffle-pool morphology with gravel, cobble and fine substrates become common. The setting of the stream in this area is primarily on a large valley flat where the riparian is largely dominated by old growth stands of conifer. This portion of the stream is still interspersed with frequent stretches of wetland type morphologies where beaver activity is frequent. These stream conditions appear to be predominant throughout the mid-section of the stream. The upper portions of the stream to its headwaters are dominated by riffle-pool morphology.

Sites 4 and 5 were completed in the area of the only bridge crossing of the Sutherland River within its mid-section. Morphology within the area was riffle-pool with abundant habitats of all types provided. The channel in the area appeared highly stable. No fish were captured at either of these sites. Duncan Creek, a tributary to the Sutherland several kilometers upstream of the locations of sites 4 and 5, was sampled slightly downstream of its crossing by the Sutherland Forest Service Road. A total of 6 rainbow trout juveniles were captured at this location. Site 3 on the Sutherland River was completed approximately 11km downstream of sites 4 and 5. The condition of the Sutherland in this area was "slough like," set within willow meadows, with a meandering channel pattern and frequent obstructions to flow and possibly fish access due to extensive beaver activity. Only rainbow trout were captured at this site, although a single dead, spent, kokanee was observed.

SUMMARY CONCLUSIONS

Some of the observed densities of juvenile coho observed in Babine Lake tributaries in 2002 were quite high, and considering the suspected large adult escapement of spawning adult coho in 2001 (see Appendix 1), this is to be expected. Subsequent comparative analysis of the distribution, abundance and growth characteristics of juvenile coho observed in 2002 with similar information collected in preceding years should provide valuable insight in the Babine coho stock(s). The visually observed presence of juvenile coho in numerous tributaries that provided minimal and/or non-contiguous wetted areas and very marginal

habitats is of note. The presence of juveniles within these systems in 2002 would appear to indicate preceding spawning activity in these systems in the fall of 2001. The juvenile coho densities and habitat conditions observed in the Sutherland River deserve considerable attention. The nature of the stream would appear to make it well suited for coho spawning and especially rearing usage. However, due to the remoteness and setting of the stream, the logistical considerations surrounding completing quantitative assessments of annual coho usage and/or assessments of productive capabilities are daunting. An aerial overview conducted in late September to assess sockeye escapement to Shass Creek, a major tributary to the system, indicated that nearly impossible conditions for boat access exist up to this point, and feasible areas to land a helicopter is also limited. Road access into the uppermost and mid-reaches of the system are present but only access the stream at two points.

RECOMMENDATIONS

There are now 9 years of juvenile coho presence and abundance information collected from tributaries to Babine Lake. A rigorous examination of this information in relation to establishing productive capabilities of the Babine Lake watershed should be initiated. This work will also determine if there is value in completing further juvenile coho surveys.

Information collected from tributaries of Babine Lake in 2002 appear to indicate relatively heavy usage by coho spawners on several streams. The 9 years of information should be assessed for the purposes of developing an annual index-based program of ground survey methodologies to estimate coho spawner abundance on the streams where this past data indicates it would be of the most value and where surveys would be logistically plausible.

Based on 2002 information from a limited number of sites, the Sutherland River appears to have the potential to be a heavily utilized coho spawner stream. As very little is known of the contributions of this stream to coho production and fish usage in general, a plan should be developed to further assess coho usage either through juvenile and/or adult assessments on this stream. Utilizing, updating where necessary, and furthering the work completed by Bustard (1989), this should be initiated by establishing a thorough biophysical inventory of the watershed.

Several of the tributary streams to Babine Lake that appear to be utilized as coho spawning habitat have a relatively lengthy portion of stream length that is

accessible and/or suitable for spawning coho. The 9 years of sampling conducted on tributaries to Babine Lake generally only focused sampling on the lowermost portions of these streams due to access conditions. Efforts should be made to determine and compare juvenile coho densities throughout the accessible length of some of these streams in order to better assess adult and juvenile usage and productive capability.

The biological characteristics of coho captured in 2002 from differing habitats and conditions of fish density have not been analyzed to determine the variability of these traits and/or the role that these factors may play in controlling productivity. This should be considered in any analysis of this or related data undertaken in the future.

ACKNOWLEDGEMENTS

Funding to undertake this survey of juvenile coho presence in tributary streams to Babine Lake was provided by Fisheries and Oceans Canada, Prince Rupert, through the efforts of Dave Peacock (Head, North Coast Stock Assessment, FOC). Joel Sawada (FOC Coho Stock Assessment Biologist, North Coast) and Kerra Hoyseth (FOC Stock Assessment Biologist) provided background information and project guidance and direction. Lake Babine fisheries staff Ray Abraham, Tony Alec, Bernard Patrick and Donna McIntyre provided field technical assistance. Brian Toth (Biologist, Lake Babine Nation) and Bill Spenst (Fisheries Program Director, Lake Babine Nation) compiled related data and authored this report.

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