



Chinook Radiotelemetry Project

Skeena River 2010

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**Report to:
Pacific Salmon Commission Chinook Technical Committee
Skeena Watershed Initiative**

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Executive Summary

Chinook Radiotelemetry Project: Skeena River 2010

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The Skeena Watershed is the second largest Chinook salmon (*Oncorhynchus tshawytscha*) producing watershed in British Columbia. It hosts more than 30 populations of Chinook which spawn in over 56 census units. In 2010 we carried out the first watershed-wide radiotelemetry project for Chinook salmon in the Skeena River. Our objectives were to tag Chinook and trace them to their spawning sites, determine the effectiveness of the latest Skeena Chinook microsatellite DNA baseline in predicting travel to known stock spawning zones, and to develop information on Chinook populations in the upper Skeena.

Chinook were captured, DNA samples taken, and tags applied near the head of the Skeena estuary with supplemental tagging at Kuldo above the Babine River. 451 tags were applied overall. Chinook location and migration were determined by 13 fixed stations along the Skeena and major tributaries and by 11 mobile surveys with a small airplane supplemented with boat and helicopter surveys.

Radio-tag retention was 97% . Mobile surveys recovered 75% and 93% of the Chinook tagged at Kwinitza and Kuldo, respectively, and 93% of the Chinook that were tagged at Kwinitza that proceeded upstream of Oliver.

Chinook movement up the Skeena River is fairly uniform, and in general the fish move steadily upstream at 15 to 25 km/day. As the various Chinook stocks separate and approach their destination tributaries they appear to slow down. This is particularly marked below the Kalum River. Chinook that traveled up major tributary rivers spent significantly more time at the river confluences than fish heading further up the mainstream ($p < 0.0001$ for the Bulkley, Sustut and Kispiox River confluences).

The number of Chinook known to have been taken in fisheries is relatively low. Chinook tagged in the lower river experienced 14% capture above the tagging site. Most of the terminal and in-river fishing for Chinook is by First Nations (66% of the total fishing).

The radio-tagged Chinook were analyzed and assigned to the 32 sub-populations defined in the Skeena Chinook baseline. The genotypes of 99% of the Chinook that were submitted for analysis were successfully obtained. The overall stock abundance for the radio tagged Chinook assemblage is similar to the abundances derived from analysis of the Tyee Test Fishery collections

Recent improvements to the Skeena Chinook baseline has demonstrated the importance of the upper Skeena Slamgeesh and Squingula stocks which now appear to be among the 10 largest Skeena sub-populations. In the lower river, relatively few tags were tracked to the Kitsumkalum watershed. The tracking data and genetic analyses suggest that the Kitsumkalum run constitutes less than half the Chinook escapement of the lower Skeena.

Most of the microsatellite DNA assignments agreed with the radiotelemetry results overall. Slightly over half (52%) of the Chinook returned to the specific sites predicted by the baseline genetics. If we take a less stringent view and divide the Chinook cladogram (Figure 6) into the five identified clades, then 77% of the Chinook went to predicted spawning localities.

The widespread mobile surveys found Chinook present at all of the known spawning zones and widely distributed downstream of these sites. Of the 382 Chinook that were tagged and traced to an upstream position, 30% were found outside of known or appropriate seeming spawning areas. As the mobile surveys took place near the end of the spawning season and many tags were relocated in nearby localities weeks apart, it is unlikely that these Chinook spawned. It is apparent that there are considerable losses in transit and furthermore that many Chinook end up at unexpected spawning sites. The genetic evidence and radiotelemetry can be reconciled if the straying Chinook have low breeding success.

The overall success of microsatellite DNA in predicting the clade and stock assignments of tagged fish, however modest, supports the continued use of genetic analysis of representative samples of Skeena Chinook such as the Tyee Test Fishery to determine escapements of the larger Skeena Chinook components.

The migratory delays observed with radio-tagging were much more prominent at the lower Skeena tagging site located at the freshwater end of the estuary than at the upriver site at Kuldo. Nearly 90% of the tagged fish at the lower station dropped back for some period of time and 16% never came back upriver. At the upriver tagging site, only 10% of the fish (12 of 119) dropped back downstream. The more extreme reaction to capture and tagging of Chinook in the estuary is likely related to the osmoregulatory stress of fresh water entry.

Introduction

The Skeena watershed is the second largest Chinook salmon (*Oncorhynchus tshawytscha*) producing watershed in British Columbia. Interest in management of its various constituent stocks has increased in recent years. Grants from the Sentinel Stocks Program of the Pacific Salmon Commission Chinook Technical Committee and the Skeena Watershed Initiative through the Pacific Salmon Foundation provided the core funding for radio-telemetry based research on Skeena Chinook stocks. Additional funds were supplied by the Skeena Fisheries Commission.

The Skeena River supports numerous Chinook stocks throughout the watershed. The Department of Fisheries and Oceans Canada has recorded escapement to at least 56 localities at least once during the past 60 years (DFO SEDS 2007). Large spawning populations are much less common and make up about ten populations.

Nearly all of the Chinook stocks are summer run, entering the Skeena for the most part in June and July. A few small widely disjunct stocks are spring runs, entering the Skeena mostly in May. All of the Chinook show a stream type life history with parr spending one or two years in streams followed by spring migration to the ocean for a residence of one to six years (Healey 1991, Winther & Candy 2010, Naughton et al 2008, Gottesfeld & Rabnett 2008).

In the northern portion of the Pacific Salmon Treaty region, radiotelemetry based comprehensive surveys of Chinook spawning areas and determinations of the approximate stock proportions have been done for the Alsek River (Pahlke et al 1999), the Taku River (Eiler 1995), the Stikine River (Pahlke and Etherton 1999) the Unuk River (Pahlke *et al.* 1996), the Nass River (Koski et al. 1996a, 1996b), and the Atnarko River (Vélez-Espino *et al.* 2010). This is the first Chinook radiotelemetry study for the Skeena River.

This study is related to a concurrent effort to improve the genetic characterization of the Skeena River stocks. Development of a genetic baseline over the past few years has raised the possibility of using the Tyee Test Fishery sampling as a proxy for evaluating the strength of the larger Skeena Chinook stocks. This study is in part an attempt to evaluate the predictive quality of the current state of development of the Skeena Chinook microsatellite DNA baseline.

Methods

2.1 Study Area

The Skeena River is the second largest watershed in British Columbia with an area of about 54,400 km² (Figure 1). It is about 600 km long, and extends from the Rocky Mountains and Nechako Plateau at its eastern edges to the ocean. The climate varies from a continental boreal forest climate with moderate rainfall, short warm summers and cold winters to a wet coastal zone of coniferous rainforests with high rainfall and moderate climates. Rainfall is year-round with a minimum in the spring and maximum in the early winter. The rivers of this watershed are large. The lower Skeena is ungauged but has a peak discharge of about 9000 m³sec⁻¹. Chinook utilize riverine habitat for spawning and rearing from the very northernmost reaches of the watershed to the estuary.

Chinook salmon were captured, tagged and released primarily in the upper estuary zone with supplemental releases in the upper Skeena above the Babine River. Lower river releases were at four sites near Kwinitsa; the upper river release site was upstream of the Kuldo River (Figure 1 and Table 1). Stationary receivers were deployed at thirteen sites along the Skeena River and Bulkley River mainstreams, generally at major tributary confluences (Figure 1 and Table 2). One of the stationary receivers was positioned at Scuttsap, below the lower Skeena River release sites to detect tagged fish that dropped down river after being released. Mobile surveys with receivers were conducted in late August and early September and covered all of the larger tributaries of the Skeena River upstream of Terrace, and most Chinook-bearing areas below Terrace. For the purpose of this study, the Skeena River watershed was separated into 68 zones based on stationary receiver positions plus upstream reaches and tributaries covered during the mobile surveys (Figure 2).

Table 1. Fishing sites UTM positions (UTM NAD 83, Zone 9).

Fishing site name	Easting	Northing
Kuldo	568908	6191153
Hydro Pole	466397	6008694
Feak Point	467491	6009561
China Bar East	472623	6013940
Salvus Eddy	477083	6017578

Table 2. Stationary receiver positions (UTM NAD 83, Zone 9).

Stationary receiver name	Number of antennas	Easting	Northing
Scuttsap	2	464066	6008440
Salvus	2	476937	6018020
Remo	4	520883	6040033
Kalum Junction	2	522294	6041739
Zymoetz Junction	2	533809	6043901
Oliver Creek	2	545477	6074882
Bulkley Junction	3	584123	6122823
Morice River	2	640123	6017022
Kispiox Junction	2	582842	6133574
Babine Junction	3	582141	6173217
Sicintine Junction	3	564864	6211340
Squingula Junction	3	598354	6237889
Sustut Junction	3	601141	6242623

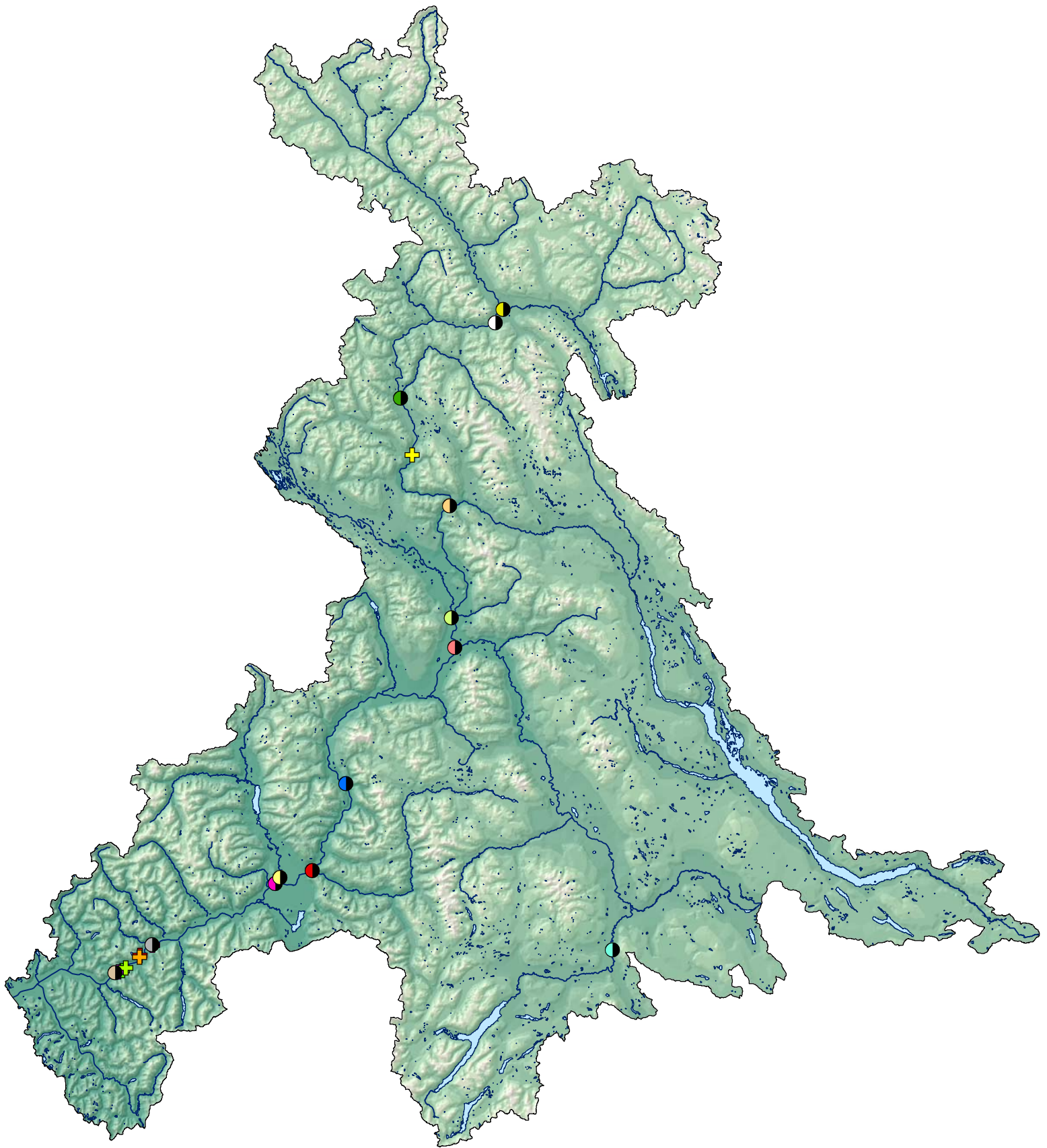
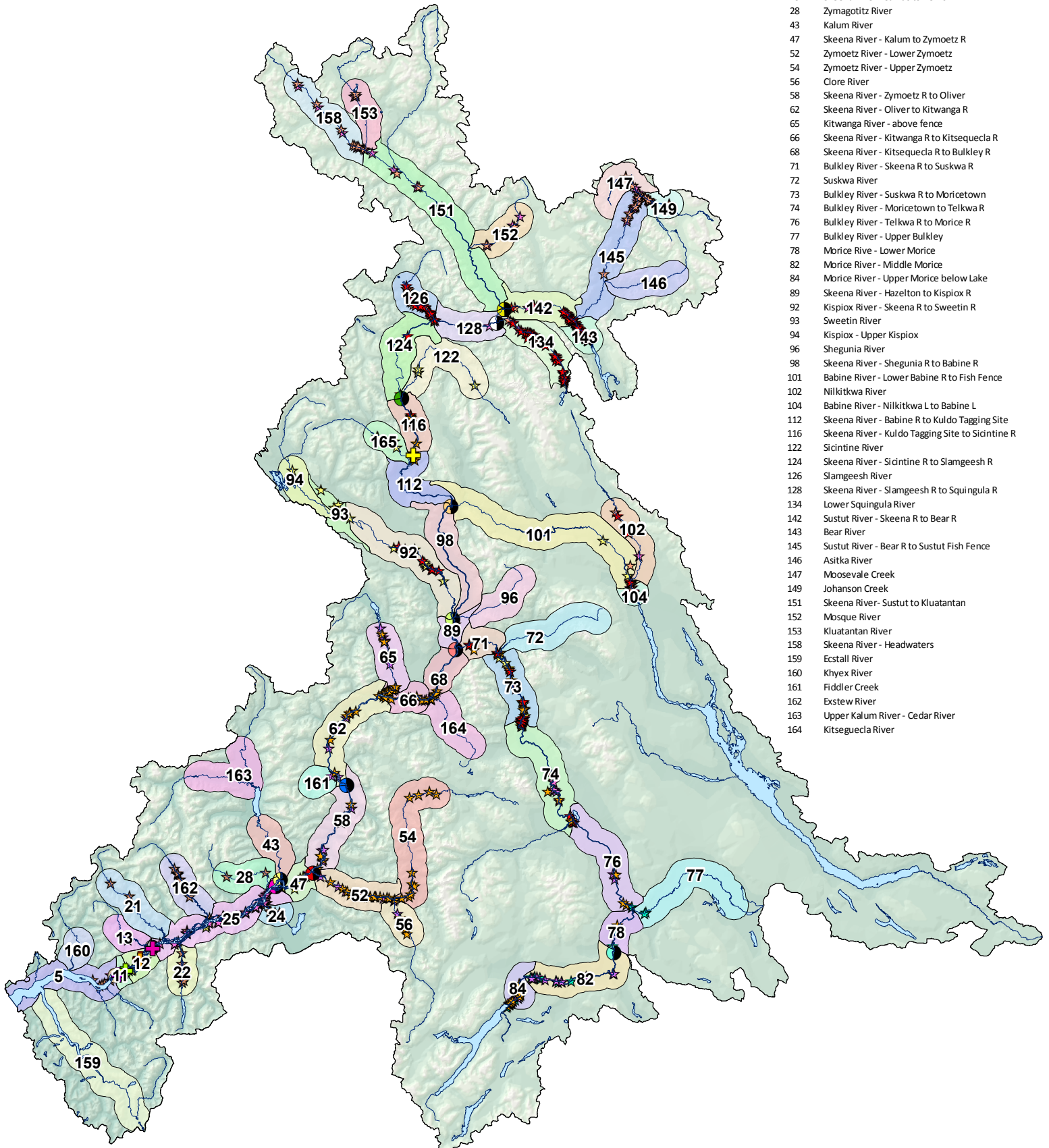


Figure 1. Receiver and tagging localities.

Skeena Watershed Zones



ID	NAME
5	
11	Skeena River - Scuttsap to Tagging Site
12	Skeena River - Tagging Site to Salvus
13	Kasiks River
21	Exchamsiks River
22	Gitnadoix River
24	Lakelse River
25	Skeena River - Salvus to Remo
28	Zymogotitz River
43	Kalum River
47	Skeena River - Kalum to Zymoetz R
52	Zymoetz River - Lower Zymoetz
54	Zymoetz River - Upper Zymoetz
56	Clore River
58	Skeena River - Zymoetz R to Oliver
62	Skeena River - Oliver to Kitwanga R
65	Kitwanga River - above fence
66	Skeena River - Kitwanga R to Kitsequecla R
68	Skeena River - Kitsequecla R to Bulkley R
71	Bulkley River - Skeena R to Suskwa R
72	Suskwa River
73	Bulkley River - Suskwa R to Moricetown
74	Bulkley River - Moricetown to Telkwa R
76	Bulkley River - Telkwa R to Morice R
77	Bulkley River - Upper Bulkley
78	Morice River - Lower Morice
82	Morice River - Middle Morice
84	Morice River - Upper Morice below Lake
89	Skeena River - Hazelton to Kispiox R
92	Kispiox River - Skeena R to Sweetin R
93	Sweetin River
94	Kispiox - Upper Kispiox
96	Shegunia River
98	Skeena River - Shegunia R to Babine R
101	Babine River - Lower Babine R to Fish Fence
102	Nilkitkwa River
104	Babine River - Nilkitkwa L to Babine L
112	Skeena River - Babine R to Kuldo Tagging Site
116	Skeena River - Kuldo Tagging Site to Sicintine R
122	Sicintine River
124	Skeena River - Sicintine R to Slamgeesh R
126	Slamgeesh River
128	Skeena River - Slamgeesh R to Squingula R
134	Lower Squingula River
142	Sustut River - Skeena R to Bear R
143	Bear River
145	Sustut River - Bear R to Sustut Fish Fence
146	Asitka River
147	Moosevale Creek
149	Johanson Creek
151	Skeena River - Sustut to Kluatantan
152	Mosque River
153	Kluatantan River
158	Skeena River - Headwaters
159	Ecstall River
160	Khyex River
161	Fiddler Creek
162	Exstew River
163	Upper Kalum River - Cedar River
164	Kitsequecla River

Figure 2. Recovery zones for the Skeena Watershed.

2.2 Study Design

A large radiotelemetry project for the Skeena River Chinook was carried out in May to October 2010. The major components of the study were:

- 1) The application of 400 radio-tags to adult Chinook migrating through the lower Skeena from early May through the end of July;
- 2) Application of an additional 100 radio-tags at Kuldo above the Babine River;
- 3) Determination of the stock of origin for each radio-tagged Chinook based on the Skeena microsatellite DNA baseline;
- 4) Deployment and maintenance of 13 fixed-station receivers at strategic locations (i.e. below tagging sites and at junctions with major tributaries);
- 5) Focused mobile tracking to determine the spawning locations and the fate of radio-tagged fish.

2.3 Fish Capture and Tagging

The Chinook capture and tagging at the lower Skeena River location and the upper Skeena River location were conducted by two different teams. The general capture and tagging techniques used by the two teams were similar, with minor differences. The following paragraphs describe the capture and tagging techniques used and the differences of technique between the two teams. A total of 332 and 119 Chinook were tagged on the lower and the upper Skeena River, respectively.

Fish Capture Timing and Procedures

Lower Skeena River and upper Skeena River fishing sites and fishing timing were chosen for sampling based on the results of feasibility studies conducted in 2008 (Plate & English 2008, Gottesfeld & Muldon 2008). Fishing at the lower Skeena River sites started on May 25th and continued until July 25th, with four gaps totalling nine days during that period. Fishing at the upper Skeena River site was carried out continuously without interruption from July 10th until August 3rd.

Chinook were captured at the lower Skeena River fishing sites using gillnets with mesh size varying from 6 to 8 inches. The gillnets were fished as set nets until July 18 and as drift nets for the last week. At the upper Skeena River fishing site, fish were captured exclusively using set nets with mesh size of 6 inches. The small mesh size ensured that the Chinook were less likely to be gilled, but were instead tangled in the loose-hanging mesh. At both the lower and upper Skeena River fishing locations, the gillnets were retrieved as soon as a fish had hit the net, which was made evident by the movement of the cork line of the net. Captured Chinook were removed gently but quickly from the tangle gillnet.

Fish Tagging Procedures

At all fishing sites, fish were placed in a tagging trough immediately after they were removed from the gillnet. The fish were then measured (nose-fork length), tissue samples were taken for DNA analysis from the operculum using a hole punch, and scale samples were taken for age analysis. Finally, a radio transmitter was inserted orally into the stomach of the fish using a plastic applicator. The 43 cm antenna was left extending out of the mouth. All fish were released immediately after the tagging procedures were completed. The condition of the fish upon release and the tagging time (starting when the fish was lifted out of the water until the fish was released) was also recorded. The targeted maximum tagging time was two minutes.

2.4 Fish Tracking Equipment and Procedures

Radio tags were scanned using a receiver before use to assure they were functioning. Once released, the tagged Chinook were monitored by tracking the location of the radio transmitters inserted into their stomach using fixed and mobile radio receivers and data loggers.

Radio-transmitters

Coded radio transmitters model MCFT-3L manufactured by Lotek Wireless Fish & Wildlife Monitoring Inc. were used for this study. The radio transmitters were 16 mm in diameter, 73 mm long, with antennas that were 430 mm long. They were powered with a 3.6 volt lithium battery, with an expected operating life of 192 days. Three different radio frequencies within the 150 MHz band were used (150.540, 150.640 and 150.780 kHz), each of which could be separated into four different burst rates (4.0 to 5.5 second duration) with up to 256 codes.

Radio receivers/data loggers and antenna

Mobile and fixed radio receivers/data loggers were model SRX 400 or SRX 400A manufactured by Lotek Wireless Fish & Wildlife Monitoring Inc. Data logger storage capacity was either 128K or 512K. The antennas were of 3 element Yagi design.

Fixed Stations

In the spring of 2010, a total of 13 fixed stations were set-up with receivers/data loggers and antennas along the Skeena River at select mainstem sites and at major tributary confluences (Figure 1 and Table 1. Radiotelemetry receivers in this configuration are effective in recording fish passage at several hundred meters to several kilometers (Winter *et al.* 1978, Winter 1996, Peters *et al.* 2008).

Each station was equipped with a receiver/data logger with two to three directional antennas pointed upstream and downstream and upstream on the tributary stream if appropriate. A switcher unit linked to the antennas via coaxial cables sequentially sampled each antenna for each frequency. A complete cycle was completed each 36 or 54 seconds. A 12 V deep cycle battery powered the receivers and data loggers. At remote sites the receiver/data logger was connected to a solar panel to keep the battery charged. Each stations were also regularly maintained to check the power level of the battery and download data onto a laptop computer. Sites with road access were visited more frequently. There were no instances of failure due to power loss. However storage on data loggers set up at tributary confluences occasionally overfilled due to Chinook lingering at the stream confluences sometimes for several days.

Fixed stations were located upstream and downstream of the tagging sites to record drop-back frequency and delays in migration. The Scuttsap receiver was positioned approximately 2 km downstream of the Kwinitisa tagging sites. The first upstream receiver (Salvus) was positioned approximately 16 km upstream of the Kwinitisa tagging site. The corresponding distances from the Kuldo tagging site were 38.4 km downstream to the Babine River confluence and 23.2 km upstream to the Sicintine River confluence.

Mobile Tracking

Eleven mobile surveys were undertaken to accurately locate the tagged Chinook. Most surveys were with a fixed-wing aircraft, but surveys in the lower Skeena were made by river boat and helicopter (Table 3). The fixed wing surveys used Yagi antennas connected to the wing struts on either side of the plane. The signals of the two antennas were combined and the resulting data were recorded by two receivers, which scanned the three frequencies at desynchronized schedules. Two mobile GPS units recorded the track of the mobile surveys.

The geographic positions of relocated Chinook were determined by using the time stamp of the record. Since the antennas were directed ahead of the airplane at 45° positions of the fish could be corrected by using the altitude of the aircraft above the river surface to project the position ahead along the route of travel.

The mainstem Skeena River downstream of Terrace was surveyed by boat and helicopter. The main Chinook tributaries downstream of Terrace were surveyed by helicopter once, except for the Kalum River, which was not surveyed.

2.5 Telemetry Data Management and Analysis

Fixed stations database

The data downloaded from the stationary receivers/data loggers was validated and organized using “Telemetry Manager”, a custom salmon radio telemetry database software developed by LGL Ltd.. For this study, the following data validation criteria were set into the software: signal intensity had to be greater than 50 on a scale of 1 to 242; at least two signals from a potential fish had to be recorded on a data logger within 20 minutes (a single record or records separated by more than 20 minutes were rejected); detections had to be recorded at zones that were geographically located between the locations of previous and subsequent valid detections; detections requiring unrealistic travel times were removed. Once rejected records were removed, the software created a database of sequential detections for each fish.

Table 3. Mobile surveys date, mode of transport and areas surveyed

Date	Mode of transport	Area surveyed
10-Aug-10	Airplane	Skeena River from Zymoetz River to Sicintine River, Kitwanga River, Zymoetz River, Clore River, Telkwa River, Bulkley River from Houston to Telkwa, and lower Morice River
17-Aug-10	Airplane	Bulkley River from Telkwa to Hazelton, Skeena River from Hazelton to Sustut River, Telkwa River, Slamgeesh River, Squingula River, lower Sustut River, Bear River, Nilkitkwa River, upper Babine River
24-Aug-10	Airplane	Morice River, upper Bulkley River
26-Aug-10	Airplane	Skeena River from Slamgeesh River to headwater, Kluatantan Creek, Tantan Creek, Mosque River, Sustut River, Moosevale Creek, Johansen Creek, Squingula River, Bear River, Nilkitkwa River, upper Babine River
28-Aug-10	Boat	Skeena River mainstem downstream of Terrace
31-Aug-10	Airplane	Bulkley River, Telkwa River, upper Morice River, Zymoetz River, Clore River, Kitwanga River, Skeena River from Kitwanga to Shegunia River, Shegunia River, Suskwa River
05-Sep-10	Airplane	Bulkley River from Smithers to Hazelton, Skeena River from Hazelton to Kispiox, Kispiox River, Sweetin River, Nangeese River, Kuldo Creek, Skeena River from Kuldo Creek to Sicintine River, Babine River, Nichyeskwa Creek
07-Sep-10	Airplane	Upper Babine River, Squingula River, Skeena River between Squingula River and Slamgeesh River, Slamgeesh River, Skeena River headwaters, Kluatantan Creek, Mosque River, Sustut River, Bear River, Moosevale Creek
08-Sep-10	Airplane	Bulkley River from Smithers to Houston, Morice River, Clore River, lower Zymoetz River, Skeena River from Zymoetz River to Gitsegukla, Fiddler Creek, Kitwanga River, Gitsegukla River
15-Sep-10	Boat	Skeena River downstream of Zymoetz River
22-Sep-10	Helicopter	Skeena River downstream of Terrace, Gitnadoix River, Kasiks River, Exchamsiks River, Exstew River, Zymagotitz River

Mobile surveys database

Data from the receivers/data loggers used during the mobile surveys was validated using the same criteria as applied to the fixed receivers. When a radio-tag was detected more than once during a specific mobile survey, only the record with the highest signal intensity was kept. Once the rejected records were removed, the date and time of each detection was corrected considering the course, speed and altitude of the plane (provided by the GPS on board), and the angle of the antenna on the plane (approximately 45 degrees). A UTM location was assigned by matching the date and time of the tag detections to the closest available GPS readings on the mobile survey GPS track. This procedure adjusted determined positions from 100 to 800 meters. This correction was applied to improve the location accuracy of the detection made during the plane surveys only. Corrections were not performed for helicopter surveys where slower speeds made corrections less valuable. River boat surveys tag positions were also not corrected.

Database organization

The fixed stations and the mobile surveys database were joined, which created a database of sequential locations for each fish including fixed station detections and mobile detections. Each record included the fish number, the zone number and name, the number of successive detections in a specific zone, the first and last date and time, and the maximum signal intensity for those successive detections.

Terminal zone determination

A terminal zone was determined for each radio-tagged fish based on the zone assignments shown in Figure 2. Each Chinook record was examined for consistency of location assignment rules. Generally the most upstream zone in which a radio-tagged fish was seen was determined to be the terminal zone for that fish, however some exceptions were encountered and necessitated the use of personal judgment. For example, when a radio-tagged fish was detected at a known Chinook spawning location downstream of where it had been previously detected, the zone corresponding to the known Chinook location was determined to be the terminal zone for that specific fish.

Receiver detection efficiencies

Detection efficiencies for each stationary receiver were estimated by dividing the total number of radio-tagged fish detected at the site by the total number of radio-tagged fish known to have passed in the vicinity of the stationary receiver. The total number known to have passed included all those fish detected at that receiver plus those detected further upstream by stationary and mobile receivers, and also the radio-tagged fish that dropped back downstream after being detected further upstream.

In-river migration rate

Travel times between stationary receivers and travel rates were calculated for each radio-tagged fish based on the date and time of the last detection at a receiver and the date and time of the first detection at the next stationary receiver the fish was observed at.

DNA Analysis

Tissue samples from the Chinook salmon collected for radio-tagging were analyzed at the DFO Molecular Genetics Laboratory at the Pacific Biological Station in Nanaimo. They were compared with baseline samples collected from 32 Skeena River populations (Appendix 3 of Winther and Candy 2010). Samples were analyzed for 15 microsatellite loci using methods of DNA extraction, PCR reaction, electrophoresis, and allele scoring described by Candy et al. (2002) and Beacham et al. (2006). A few specimens were omitted because more than 5 loci failed to be read. The population assignment program of Pella and Masuda (2001) was used for the analyses. The model output included individual assignments to baseline populations where the posterior distribution gives probabilities for the five most likely populations for each sample. In addition a genetic marker for sex was run to determine the sex of tagged fish.

Results

The overall annual escapement of Chinook to the Skeena is in the range of 60,000 to 100,000 (Winther and Candy 2011). The 2010 Chinook run was similar in magnitude to those of the past few years, but catches of Chinook at the Tyee Test Fishery were somewhat less. The index on July 31 2010 was 172 compared to the average of the preceding decade of 278 and 213 for the 1990s. Winther and Candy (2011) estimate the 2010 Skeena Chinook run at Tyee in the Skeena estuary as 93,121 fish with a standard deviation of 18,688 fish based on mark and recapture of Kitsumkalum River Chinook and the proportion of Kitsumkalum Chinook in the Tyee test fishery sampling.

The snow pack in the winter of 2009-2010 Skeena watershed was below normal throughout the Skeena Watershed. The snow water content averaged 85% of normal on April 1, 2010 (9 stations), and 81% on May 1 (7 stations). Runoff timing was approximately modal but the flow generated was less than normal with a peak flow on May 29 of 3,182 cubic meters sec^{-1} , the fifth lowest flow in the 77 year record at Usk, the gauging station above Terrace. Figure 3 shows the 2010 discharge of the Skeena at Usk compared to the maximum, minimum and mean discharges over the 79 years of record at this station. Water flows were close to the minimum levels of the Usk station record throughout July and August, when most of the Chinook migration occurred.

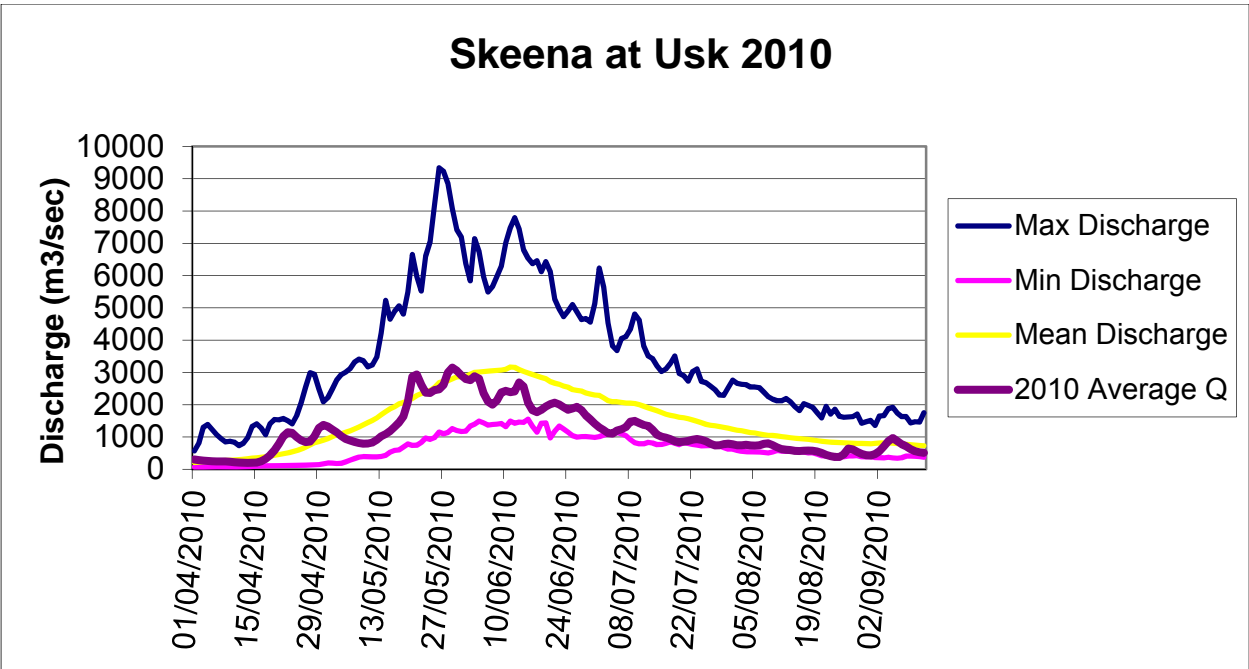


Figure 3. Skeena River at Usk annual hydrograph for 2010. The 2010 hydrograph is compared to the maximum, minimum and mean values for each day.

3.1 Catch Timing

Kwinitsa tagging sites are approximately 40 km upstream of the Tye test fishery but both areas are within the estuarine zone of the Skeena. As anticipated, fishing at Kwinitsa began after the earliest Chinook entered the Skeena. For the period of fishing at Kwinitsa the capture rate closely parallels that of the Tye test fishery (Figure 4). It appears that the goal of sampling the complete run of summer Chinook was attained.

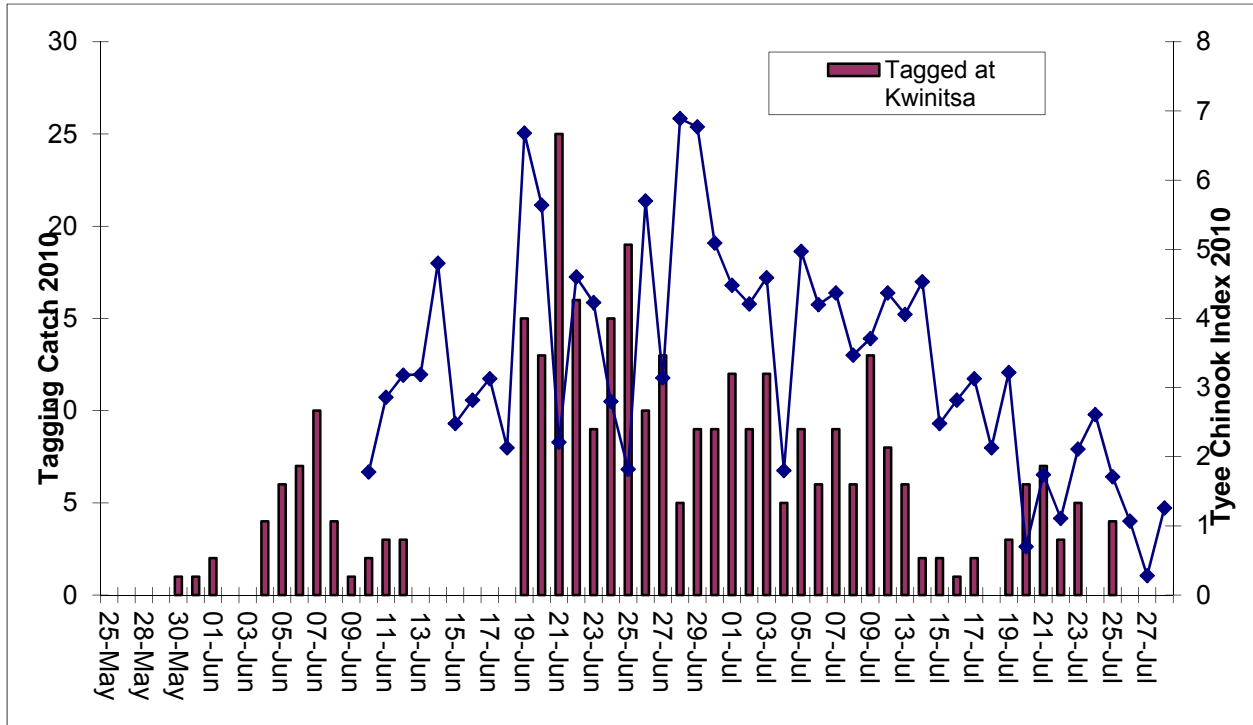


Figure 4. Chinook radio-tagging rate in the lower Skeena compared to the index of Chinook escapement determined by the Tye Test Fishery.

3.2 Estimated receiver detection efficiencies

The estimated detection efficiencies for each receiver are presented in Table 4. Chinook are assumed to have passed the fixed receiver if they are detected upstream at other fixed receivers, by mobile surveys or by tag recoveries. A single tagged fish is also assumed to have passed a receiver twice if it is detected upstream of that receiver and then downstream of the same receiver. All but four of the receivers had estimated detection efficiencies greater than 90%. The receivers with the lowest estimated detection efficiencies were the Zymoetz Junction (68.2%), Sicintine Junction (76.1%), Squingula Junction (74.2%) and Scuttsap (78.2%) receivers. The Zymoetz receiver was positioned approximately 1 km upstream of the junction of the Zymoetz River and the Skeena River. For that reason, it did not detect all of the tagged fish migrating up the Skeena River, however it apparently detected all of the fish that migrated up the Zymoetz River.

The low detection efficiencies observed at the Sicintine Junction and Squingula Junction receivers are most likely due to the failure of the data loggers for a few days during the peak of the Chinook migration. The Sicintine Junction receiver/data logger did not record detections between the afternoon of July 23 and the afternoon of August 3. The Squingula Junction receiver/data logger did not record detections between the evening of July 27 and the late morning of August 3. It appears that the two receivers/data loggers ceased to record data because the data loggers' memories were full. On August 3, the data was downloaded from those two receivers/data loggers and their memory was emptied.

No fixed receivers were upstream of the Kitsumkalum River mouth and mobile surveys were not conducted on the Kalum River upstream of the receiver so that except for the lack of tag recoveries, the 100% efficiency is largely assumed.

The use of a small fixed wing airplane for collecting data allowed accurate recording of salmon locations while traveling at an average velocity of 169km/hr at a relatively low cost. In total 6369 km of river reaches were surveyed by fixed wing aircraft. The estimated efficiency of recovery for Kwinitza Chinook that traveled past Oliver was 93%. The proportion of Chinook tagged at the Kuldo site that were relocated in mobile surveys was also 93%.

The tag retention rate and tag-related mortality suggest low loss rates. Of the 119 Chinook tagged at Kuldo, the locality without a high drop-back rate, two died or regurgitated their tags near the tagging site. In addition a single Chinook, perhaps a carcass drifted downstream as far as Terrace. The overall tagging success rate of 97% is close to the 98% rate reported by Ramsted & Woody 2003 for sockeye in Alaska.

Table 4. Estimated total number of times tagged Chinook passed each stationary receiver compared to the number of detections by each stationary receivers.

The estimated detection efficiency was calculated by dividing the number of detections at each receiver by the number of times tagged Chinook passed each stationary receiver.

Receiver name	Number of times tagged Chinook assumed to have passed station	Number of tagged Chinook detections	Estimated detection efficiency (%)
Scuttsap	380	297	78.2
Salvus	279	256	91.8
Remo	254	242	95.3
Kalum River	29	29	100.0
Zymoetz Junction	217	148	68.2
Oliver Creek	171	170	99.4
Bulkley Junction	137	133	97.1
Morice River	24	24	100.0
Kispiox Junction	73	72	98.6
Babine Junction	50	49	98.0
Sicintine Junction	142	108	76.0
Squingula Junction	124	92	74.2
Sustut Junction	100	97	97.0

The mobile surveys relocated most of the Chinook that migrated upstream into the survey areas. All but 6 of the 451 tagged Chinook were relocated post-tagging. This includes 52 fish that were tagged at Kwinitza and 5 fish that were tagged at Kuldo that dropped downriver and did not migrate, or died. Mobile surveys recovered 75% and 93% of the Chinook tagged at Kwinitza and Kuldo, respectively. If only the Chinook tagged at Kwinitza that proceeded upstream of Oliver are considered, mobile surveys had a percentage of recovery of 93%, a nearly identical proportion of those that were tagged at Kuldo.

The detailed of the recovery proportions for fixed and mobile surveys are given in Table 5 and 6. The number of Chinook found in each of the mobile surveys is shown in Table 7.

Table 5. Relocation success of tagged Chinook.

	Kwinitsa	Kuldo	Total
Number of tagged fish	332	119	451
Number of fish relocated	328	117	445
Number of fish not relocated	4	2	6
Percentage of fish relocation	98.80%	98.32%	98.67%
Total number of post-tagging drop backs	294	12	306
Percentage of post-tagging drop backs	89.63%	10.26%	68.76%
Number of drop backs (did not come back up)	52	10	62
Percentage of drop backs (did not come back up)	15.85%	8.55%	13.93%
Number of drop backs (did not come back up and likely did not spawn)	52	5	57
Percentage of drop backs (did not come back up and likely did not spawn)	15.85%	4.27%	12.81%
Number of fish relocated during MOB surveys	219	107	326
Number of tagged fish recovered before mobile surveys started	41	4	45
Percentage of fish relocated during MOB surveys	75.26%	93.04%	80.30%
Percentage of Kwinitsa fish that passed Oliver relocated	92.81%		

Table 6. Relocation success at fixed stations.

	Number of relocations at fixed stations (Kwinitsa)										
	10	20	30	40	50	60	70	80	90	100	
	Scuttsap	Salvus	Remo	Kalum Mouth	Zymoetz Rive	Oliver Creek	Bulkley Junct	Morice River	Kispiox	Babine Junc	
Number of relocations	297	256	242	29	147	169	130	25	63	38	
Number of fish relocated	290	248	220	25	136	164	126	24	61	38	
Number of fish that passed receiver	291	271	231	25	201	165	129	24	62	39	
Number of passes not recorded (fish rec	82	0	1	0	4	0	0	0	0	0	
Number of passes not recorded	83	23	12	0	69	1	3	0	1	1	
Number of times a fish passed receiver	380	279	254	29	216	170	133	25	64	39	
Receiver Efficiency (per fish)	99.66%	91.51%	95.24%	100.00%	67.66%	99.39%	97.67%	100.00%	98.39%	97.44%	
Receiver Efficiency (per passes)	78.16%	91.76%	95.28%	100.00%	68.06%	99.41%	97.74%	100.00%	98.44%	97.44%	
	Number of relocations at fixed stations (Kuldo)										
	10	20	30	40	50	60	70	80	90	100	
	Scuttsap	Salvus	Remo	Kalum Mouth	Zymoetz Rive	Oliver Creek	Bulkley Junct	Morice River	Kispiox	Babine Junc	
Number of relocations	0	0	0	0	1	1	3	0	9	11	
Number of fish relocated	0	0	0	0	1	1	3	0	7	9	
Number of fish that passed receiver	0	0	0	0	1	1	4	0	7	9	
Number of not recorded passes (fish rec	0	0	0	0	0	0	0	0	0	0	
Number of passes not recorded	0	0	0	0	0	0	1	0	0	0	
Number of times a fish passed receiver	0	0	0	0	1	1	4	0	9	11	
Receiver Efficiency (per fish)					100.00%	100.00%	75.00%		100.00%	100.00%	
Receiver Efficiency (per passes)					100.00%	100.00%	75.00%		100.00%	100.00%	

Table 7. Successful relocations in each mobile survey.

Number of relocations per mobile surveys	
10/08/2010	57
17/08/2010	101
24/08/2010	21
26/08/2010	111
28/08/2010	27
31/08/2010	69
05/09/2010	49
07/09/2010	114
08/09/2010	71
15/09/2010	41
22/09/2010	55
Total	716

3.3 In-river migration rates

Chinook movement up the Skeena River is fairly uniform (Table 8). In general the fish move steadily upstream at 15 to 25 km/day. The higher travel rate for the first few kilometers (Scuttsap - Salvus) is confounded with a general delay in initiating upstream travel and is consequently subject to various interpretations. As the various Chinook stocks separate and approach their destination tributaries they appear to slow down. Thus the Chinook approaching the mouth of the Kitsumkalum River, nearly all Kitsumkalum Chinook, travel at 2.3 km/day between the Remo and Kalum receivers. The Chinook in the Bulkley-Morice system, nearly all Morice River Chinook, are traveling 8.5 km/day from Bulkley Junction to the Morice River. The Chinook below the Sustut River, mostly Bear-Sustut fish travel an average of 10.9 km/day between the Squingula and Sustut receivers. The penultimate reaches noted for slower travel speed are of different lengths. The shortest reach (Remo-Kalum River) has the slowest travel rate. Another factor might be that the spawning beds in the Kalum River are closer to the confluence with the Skeena than the spawning beds on the other two rivers.

Table 8. In-river migration rates between the stationary receivers for the Chinook radio-tagged at Kwinitza and Kuldo.

The samples size (n), medians and 95% confidence intervals of the median are presented. Confidence intervals calculated by bootstrapping in R.

Section	Section length (km)	Kwinitza tagged chinook		Kuldo tagged chinook	
		n	Migration rate (km/day)	n	Migration rate (km/day)
Scuttsap to Salvus	18.3	167	31.09 (29.6 – 33.0)	n/a	n/a
Salvus to Remo	55.6	201	19.7 (18.6 - 20.3)	n/a	n/a
Remo to Kalum	2.2	25	2.3 (0.4 - 4.4)	n/a	n/a
Remo to Zymoetz	17.5	125	15.7 (14.0 - 17.2)	n/a	n/a
Zymoetz to Oliver	40.9	99	17.1 (13 - 19.1)	n/a	n/a
Oliver to Bulkley Junction	88.9	126	21.2 (20.4 - 21.8)	n/a	n/a
Bulkley Junction to Morice	181.3	24	8.5 (7.3 – 10.0)	n/a	n/a
Bulkley Junction to Kispiox	13.8	57	16.5 (14.8 – 17.5)	n/a	n/a
Kispiox to Babine	49.8	38	15.4 (12.4 - 17.6)	n/a	n/a
Babine to Sicintine	61.6	22	18.1 (14.8 - 19.9)	n/a	n/a
Kuldo tagging site to Sicintine	23.2	n/a	n/a		6.7 (5.9 – 7.9)
Sicintine to Squingula	67.3	17	17.6 (16.4 - 18.6)	47	16.4 (15.0 - 17.4)
Sqingula to Sustut	7.1	17	10.9 (9 .0- 12.6)	50	10.9 (9.6 - 12)

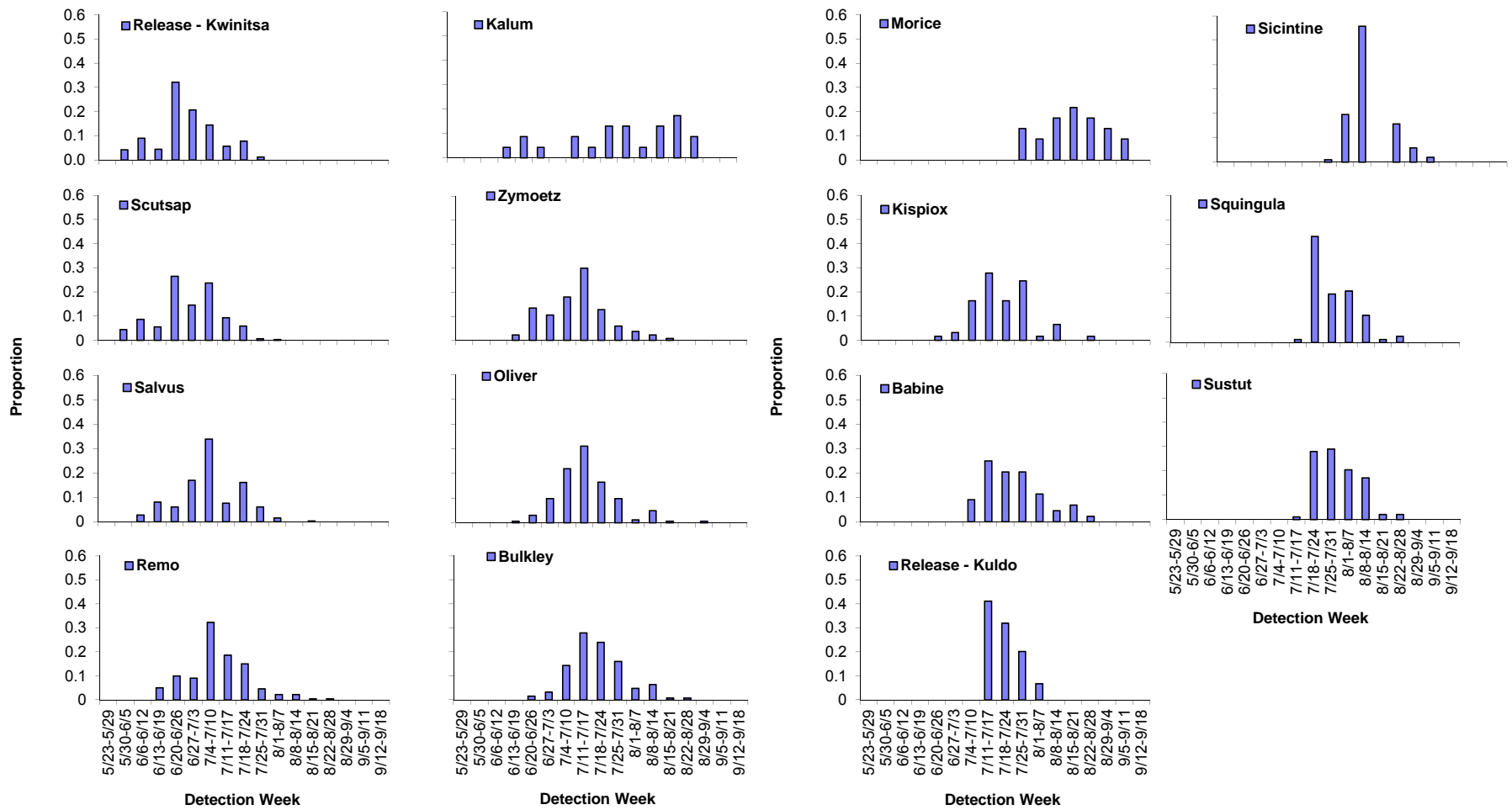


Figure 5. Chinook migration timing past fixed telemetry stations.

3.4 Chinook behaviour at major tributary mouths

The time records of Chinook travel suggest that Chinook linger at some of the confluences that form major decision points. We examined the travel records at three such points, the mouth of the Bulkley River, the mouth of the Kispiox River and the mouth of the Sustut River. At all three river forks the Chinook that were headed for that tributary stream spent more time near the confluence than Chinook that continued further up the Skeena mainstem (Table 9). At the Sustut River mouth for example, Chinook that were heading further up the Skeena River spent between 17 and 87 minutes at the junction while those that ultimately traveled up the Sustut River spent between 30 minutes and 2,868 minutes at the confluence. Since these data are clearly not normally distributed, we characterized the delay time by the median values, and compared the distributions using the non-parametric Kolmogorov-Smirnov test. The difference in delay time was highly significant at all three sites ($P < 0.0001$). The distances to the ultimate spawning sites above these travel choice points ranged from more than 20 km for the Kispiox river to over 200 km for the mouth of the Bulkley River. We also compared the delay time at the mouth of the Sustut River for Chinook spawning in the Bear River 28 to 40 km away with the delay time for Chinook spawning in the upper Sustut watershed 88 to 109 km upstream. There was no significant difference in the delay time of these two groups. ($P = 0.48$)

Table 9. Comparison of holding time for Chinook about to enter a major tributary with Chinook continuing upstream

Skeena Confluence With	Bulkley R	Kispiox R.	Sustut R.
N fish	80	58	75
Continued up Skeena	42	43	13
Continued up Tributary	38	15	62
Median Time Mainstem Fish	1:10:08	0:59:11	0:46:33
Median Time Tributary Fish	2:06:18	45:58:28	2:07:14
Statistical Significance (p<)	< 0.0001	< 0.0001	< 0.0001

3.5 Recoveries of Tagged Chinook

Some of the radio tags were recovered in recreational and First Nations Fisheries along the Skeena. Table 10 shows the distribution of tags recovered throughout the Skeena. Overall 10.4% of Chinook that were tagged were recovered in various fisheries. Of the 47 tags recovered 28 were in First Nations fisheries, especially the Gitksan gillnet fishery between Kispiox and Kitwanga and the various fisheries at Moricetown Falls on the Bulkley River. The largest single set of recoveries was at Moricetown, where Wet'suwet'en fisheries and fisheries management activities handled approximately 4694 Chinook in a large mark and recapture experiment.

Fourteen radio-tags were recovered in various recreational fisheries for the most part between Kwinitza and the Bulkley Junction at Hazelton. Ten recoveries occurred in the Skeena estuary, below Scuttsap. Eight of these tagged Chinook were recovered in the gillnet fisheries (commercial and First Nations) near the mouth of the Skeena (Areas 4-12 and 4-15). In addition to the Chinook tag recoveries in fisheries, there were 8 tags recovered from carcasses or loose on gravel bars where the carcasses were assumed to have been consumed by predators. These were scattered at dispersed localities throughout the watershed.

Table 10. Recovery Location of Radio-tagged Chinook. FN are tags recovered in First Nations Fisheries.

	Kwinitza			Kuldo			Both tagging sites
	FN	Sport; commercial; test-fishery	Total	FN	Sport; commercial; test-fishery	Total	
Downstream of Scuttsap	4	6	10	0	0	0	10
Scuttsap to tagging site	0	0	0	0	0	0	0
Tagging site to Salvus	0	2	2	0	0	0	2
Salvus-Remo	0	1	1	0	0	0	1
Remo-Zymoetz	0	1	1	0	0	0	1
Zymoetz-Oliver	0	2	2	0	0	0	2
Oliver-Bulkley Junction	6	3	9	0	0	0	9
Bulkley Junction - Kispiox	3	0	3	0	0	0	3
Kispiox-Kuldo tagging site	2	0	2	0	0	0	2
Kuldo tagging site-Sustut	0	0	0	0	0	0	0
Upstream of Sustut	0	0	0	1	0	1	1
Bulkley Junction - Telkwa	14	4	18	0	0	0	18
Upstream of Telkwa	0	0	0	0	0	0	0
Totals	29	18	47	1	0	1	48

3.6 Summary of Chinook migration and riverine fisheries removals

A summary of the known histories of the radio-tagged Chinook is given in Table 11. The proportions of fish reaching various river zones are shown along with the fate of each of these fish. These data include the fish that were “recovered” (i.e. fished) or otherwise sampled below their presumed final destinations.

No effort was made to collect radio tags at known spawning sites during spawning activities. Therefore we only know the final recorded site of the radio tagged fish, not their activities at that site.

The number of Chinook known to have been taken in fisheries is relatively low. Chinook tagged in the lower river experienced 14% capture above the tagging site based on these individual fish histories. Fish tagged at Kuldo experienced negligible fishing pressure (<1%). These data show that most of the terminal and in-river fishing for Chinook is by First Nations (66% of the total fishing). The largest fisheries are the Wet’suwet’en fishery at and near Moricetown Falls (5% of the total Skeena Chinook), the Gitksan gillnet fisheries from Kitwanga to above Kispiox (4% of the total), and the recreational fisheries (5% of the total). We assume that not all radio tags from fished Chinook were recovered and that these numbers are minimum values.

There are two Chinook stocks in the Bulkley Watershed: the small early run Upper Bulkley “springs” and the summer run Morice River Chinook which spawn below Morice Lake. The Moricetown fishery takes place after most of the Upper Bulkley Chinook have passed and targets the largest Chinook stock in the Skeena at a place where it might be considered a terminal fishery. The apparent harvest rate of Morice River Chinook in the Bulkley River Wet’suwet’en First Nations fishery based on radio tag recoveries is about 22% (N=65). In a future study more detail on the largest fresh water Chinook harvest in the Skeena could be obtained by placing a fixed radio receiver above Moricetown.

Table 11. Summary of radio-tagged fish histories by Skeena River segment including tag recovery zones and fisheries removals.

Fishery Reach		Entered (Last seen at or above)	Last in reach	Recreational Fishery	Commercial and Tye test fisheries	First Nations fisheries	Last in tributary (likely spawning)	Last in mainstem	Exited
Lower River Releases									
	Downstream of Scuttsap	46	46	0	5	3	0	38	0
	Scuttsap to tagging site	52	6	0	0	0	0	6	46
Start	Tagging site to Salvus	332	10	2	0	0	1	7	322
	Salvus-Remo	270	42	1	0	0	19	22	228
	Remo-Zymoetz	228	28	1	0	0	20	7	200
	Zymoetz-Oliver	200	36	2	0	0	21	13	164
	Oliver-Bulkley Junction	164	35	3	0	6	17	9	129
	Bulkley Junction-Kispiox	64	7	0	0	3	0	4	57
	Kispiox-Kuldo tagging site	57	28	0	0	2	23	3	29
	Kuldo tagging site-Sicintine	29	0	0	0	0	0	0	29
	Sicintine-Sustut	29	10	0	0	0	8	2	19
	Upstream of Sustut	19	19	0	0	0	17	2	0
	Bulkley Junction-Telkwa	65	37	4	0	14	0	19	28
	Upstream of Telkwa	28	28	0	0	0	26	2	0
Totals			332	13	5	28	152	134	
Upper River Releases									
	Downstream of Scuttsap	0	0	0	0	0	0	0	0
	Scuttsap to tagging site	0	0	0	0	0	0	0	0
	Tagging site to Salvus	0	0	0	0	0	0	0	0
	Salvus-Remo	0	0	0	0	0	0	0	0
	Remo-Zymoetz	1	1	0	0	0	0	1	0
	Zymoetz-Oliver	1	0	0	0	0	0	0	1
	Oliver-Bulkley Junction	3	2	0	0	0	0	2	1
	Bulkley Junction-Kispiox	3	0	0	0	0	0	0	3
	Kispiox-Kuldo tagging site	10	7	0	0	0	5	2	3
Start	Kuldo tagging site-Sicintine	119	4	0	0	0	0	4	115
	Sicintine-Sustut	105	34	0	0	0	26	8	71
	Upstream of Sustut	71	71	0	0	1	64	6	0
	Bulkley Junction-Telkwa	0	0	0	0	0	0	0	0
	Upstream of Telkwa	0	0	0	0	0	0	0	0
Totals			119	0	0	1	95	23	

3.7 Genetic character of tagged Chinook

The radio-tagged Chinook were analyzed and assigned to the 32 sub-populations defined in the Skeena Chinook baseline. The genotypes of 441 of the 446 Chinook submitted were successfully obtained. The mixed stock analysis results are shown in Table 12. The adjusted stock proportions in Table 12 include the summed probabilities of all five choices in the stock assignment software.

The determination of the overall proportion of Chinook reaching the various spawning grounds is complicated by the use of two widely separated tag application sites. Stocks downstream of Kuldo are sorted by their relative abundance in the lower river cohort. For the stocks above the Kuldo tagging site, the 119 tags applied were in addition to the 29 lower-Skeena tagged fish that ranged into the upper Skeena. The addition of the Kuldo tags is therefore adjusted by a factor of 0.165 to derive the overall percentages of radio tagged fish classified by their genetic lineage. The contributions of fish to Kuldo River and Kispiox River are more difficult to isolate because three fish from the Kuldo-tagged cohort dropped back (approximately 5 km) and went up the Kuldo River, one fish dropped back approximately 88 km and went up the Kispiox River to spawn, and one fish dropped back 38 km and went up the Babine River to spawn..

The stock proportions of the total radio-tagged Chinook presented in Table 12 are the tagged fish ratios from the lower-river stocks or for upper-river populations a proportional combination of tagged Chinook ratios from Kwinitsa and Kuldo.

The overall stock abundance for the radio tagged Chinook is quite similar to the abundances derived from analysis of the Tye Test Fishery (TTF) collections. As might be expected, the abundances of the more numerous stocks are especially similar. The Morice River spawning Chinook constitute 30.6% of the Tye Test Fishery Collections and 32.1% of the radio-tagged Chinook. These ratios are not significantly different. Neither are the abundances of the second largest stock, the Lower Kalum Chinook that are 13.7% at the TTF and 12.8% in the radiotelemetry tagging. The most noteworthy difference is in the abundance of Bear River Chinook that are 5.9% of the catch at Tye but only 0.9% of the radio-tagged fish. The lower degree of correspondence of the Babine and Bear River Chinook is probably related to the difficulty of separating these two stocks from one another and from the Morice Chinook. The Slamgeesh and Squingula stocks seem to also be confounded. In this case the two rivers are adjacent and it is not clear how well differentiated the two stocks are. Chinook from the Kitwanga River and Kispiox River, which are also adjacent, may be similarly confounded.

Recent improvements to the Skeena baseline has demonstrated the importance of the upper Skeena Slamgeesh and Squingula stocks which now appear to be among the 10 largest Skeena sub-populations. This observation is true for the Tye Test Fishery Chinook (Winther and Candy 2010), the lower Skeena Chinook Sport Fishery survey (Winther 2011) and the results discussed in this report.

Table 12. Proportion of genetic assignment of radio-tagged Chinook to various Skeena Populations

N	TyeetestFishery All Weeks May-August 2010		Skeena River Kwinitsa Radio-tag May-July 2010		Kuldo Creek Radio-tag July-Aug 2010		Adjusted All Radio-Tag 2010	
	839		332		114		446	
Stock	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD
Bear	5.9	(1.5)	0.5	(1.1)	26.6	(6.1)	0.9	(1.1)
Kluakaz_Cr	0.0	(0.2)	0.0	(0.1)	0.4	(1.6)	0.0	(0.2)
Kluatantan	0.1	(0.2)	0.1	(0.4)	0.1	(0.8)	0.1	(0.4)
Kluayaz_Cr	1.9	(0.7)	1.6	(1.1)	6.0	(3.9)	1.5	(1.1)
Kuldo	0.1	(0.3)	1.3	(1.2)	0.2	(1.3)	1.2	(1.1)
Otsi	2.6	(0.9)	0.6	(0.9)	12.4	(4.6)	0.8	(0.9)
Sicintine-Sp	0.1	(0.2)	1.3	(0.8)	1.6	(2.3)	1.2	(0.7)
Slamgeesh	5.3	(1.3)	2.7	(1.9)	0.8	(2.4)	2.4	(1.8)
Squingula	2.5	(0.9)	5.6	(1.6)	20.6	(6.1)	5.3	(1.6)
Sustut	1.0	(0.4)	2.9	(1.0)	14.6	(4.6)	2.8	(0.9)
Babine	8.8	(1.6)	1.5	(1.8)	14.9	(5.2)		
Bulkley_sp	0.9	(0.3)	1.0	(0.6)	0.0	(0.9)		
Morice	30.6	(1.8)	32.1	(2.9)	0.1	(0.9)		
Suskwa	1.3	(0.5)	3.0	(1.1)	0.0	(0.7)		
Gitsegukla	1.0	(0.5)	0.1	(0.3)	0.0	(0.5)		
Kispiox	2.1	(1.2)	3.4	(2.9)	0.1	(0.9)		
Kitwanga	3.7	(1.3)	9.5	(2.5)	0.5	(1.7)		
Nangeese_R	0.3	(0.5)	0.9	(1.3)	0.1	(0.9)		
Shequnia	0.5	(0.6)	0.1	(0.3)	0.1	(0.8)		
Skeena@Terrace	1.0	(1.1)	0.1	(0.5)	0.0	(0.6)		
Sweetin	4.8	(1.2)	0.2	(0.7)	0.8	(2.2)		
Cedar_sp	0.1	(0.1)	1.1	(0.7)	0.0	(0.7)		
Ecstall	2.0	(0.5)	0.0	(0.1)	0.0	(0.7)		
Exchamsiks	0.9	(0.6)	0.1	(0.3)	0.0	(0.6)		
Exstew	1.4	(0.6)	2.0	(1.1)	0.0	(0.8)		
Fiddler_Cr	0.0	(0.1)	0.7	(0.8)	0.0	(0.5)		
Gitnadoix	0.6	(0.6)	3.0	(1.2)	0.0	(0.8)		
Kasiks	0.1	(0.3)	0.0	(0.2)	0.0	(0.6)		
Khyex_R	0.8	(0.4)	0.0	(0.1)	0.0	(0.8)		
L_Kalum	13.7	(1.7)	12.8	(2.3)	0.1	(0.8)		
Thomas_Cr	2.6	(0.7)	7.2	(1.7)	0.0	(0.6)		
Zymoetz	2.7	(0.8)	3.8	(1.9)	0.0	(0.9)		
Zymogotitz	0.6	(0.3)	1.0	(0.8)	0.0	(0.6)		

3.8 Chinook population cladogram

There were only 10 Skeena Chinook populations sampled with sufficient intensity to provide DNA baseline material in 2007. A concentrated effort by the Skeena Fisheries Commission with funding from the Skeena Watershed Initiative improved the baseline collections so that there were 32 populations represented by 2010. These populations represent all of the medium to large Chinook populations and a few of the small populations. Three small populations, Khyex River, Kasiks River, and Lakelse River, have been only partially sampled and two small populations (Mosque River, and Nilkitkwa River) which were discovered by this radiotelemetry project have yet to be sampled. The samples for the cladogram were analyzed in the same laboratory as the radiotelemetry samples using very similar procedures. The relationship of the 32 sampled populations known is shown on the cladogram as Figure 6. Details of the genetic loci used and the sample size of each genetic segregate are given in the Appendix 3 of Winther and Candy 2010. The cladogram was produced using a neighbour-joining tree procedure (Saitou and Nei, 1987) and the F_{ST} genetic distance measure of Weir & Cockerham (1984).

The populations separate into five clades. Three of them (lower, middle, and upper Skeena) are geographic. In addition the early run populations group together as a “spring” clade. The three abundant populations spawning below large lake outlets (Morice, Babine, Bear) group are tightly grouped. Overall, the geographic grouping of the populations is striking. It is noteworthy that the largest populations in the geographic groups tend to have basal positions in the cladogram.

3.9 Comparison of final Chinook observation location to genetic character

A matrix of DNA characterization and final determined positions for each tagged fish is provided in Table 13. It compares the genetic population assignments with the observed destinations of tagged Chinook. The concordant assignments fall along the diagonal yellow band. As a whole the final locations of Chinook observed by radiotelemetry resemble the genetic determinations. In 14 of the 21 stocks represented in the radiotelemetry results the majority of the Chinook went to their expected destinations. The notable exceptions are for the Kispiox River, where some of the Chinook returned to the nearby Kitwanga River and the Babine River where most of the returns went to the Bear River. The other non-agreements were in small stocks with low returns.

In sum, most of the microsatellite DNA assignments agree with the radiotelemetry results. Slightly over half (52%) of the Chinook returned to sites predicted by the baseline genetics. The problems with agreement of the radiotelemetry results with the DNA determinations are in part due to technical problems, i.e. Chinook populations that are closely related have overlapping allele abundances and may be falsely assigned and in part due to genuine straying. We do not know exactly the magnitude of these two possibilities, we believe that both are probable. The rates of successful genetic prediction of upriver terminal localities varies widely between stocks (Table 13). It is noteworthy that some stocks that are relatively distinct genetically such as the Sustut River and Zymoetz River have over 90% accurate predictions. The spring spawning stocks have few specimens in the radio tagged sample but seem to sort reliably well. The Ecstall stock is the most divergent in the baseline but not represented in our sample since all tagging took place well upstream of the Ecstall River. Other populations which appear less differentiated such as the Bear and Babine Rivers have many mis-assignments and/or high stray rates.

Genetic assignments to clades better predict the spawning locations than stock assignments. Correct clade assignments of fish that reached any spawning area constitute 77% of the total. The assignment accuracy is highest in their clade assignment for stocks which are most differentiated. Thus stocks such as Sustut River and Zymoetz River achieved over 96% and 100% accuracy and all stock determinations improved to over 55% (Table 14).

Table 13. Comparison of DNA stock assignments with Radiotelemetry Final Locations.

Radio-Telemetry - Final Location	DNA Stock Determination																				Total	Tracking = DNA	Strays	% Tracking = DNA		
	Cedar_sp	Babine	Bear	Bulkley_sp	Exstew	Fiddler_Cr	Gitnadoix	Kispiox	Kitwanga	Kluayaz_Cr	Kuldo	L_Kalum	Morice	Otsi	Sicintine-Sp	Slamgeesh	Squingula	Suskwa	Sustut	Zymoetz/Thomas					Zymogotitz	
Cedar_sp	1																					1	1	0	100%	
Babine		2				1			1		1		1			1	1						8	2	6	25%
Bear			9	15				1	1			1	2	4	1	2	2						38	15	23	39%
Bulkley_sp				2																			2	2	0	100%
Exstew					3												1						6	3	3	50%
Fiddler_Cr						1																	1	1	0	100%
Gitnadoix							1																4	1	3	25%
Kispiox		1						3	7		1	1				1							15	3	12	20%
Kitwanga									3	10		1	1										15	10	5	67%
Kluayaz_Cr				1						2													3	2	1	67%
Kuldo		2	1								1												4	1	3	25%
L_Kalum						1					1					14							19	15	4	79%
Morice		1		1			1	1		1				22									30	22	8	73%
Otsi											2												9	2	7	22%
Sicintine-Sp		1	1												2	1							5	1	4	20%
Slamgeesh		1	4								1	1					1				1		11	0	11	0%
Squingula				2																			19	14	5	74%
Suskwa																	1						1	1	0	100%
Sustut														2									21	17	4	81%
Zymoetz/Thomas										2			1										25	21	4	84%
Zymogotitz												1											2	1	1	50%
Exchansiks							1						1										2			
Kasiks							1																1			
Lakelse					1													1					5			
Upstream of DNA stock		2	1						2			3	3				4						15			
Total	1	19	26	3	4	3	6	8	26	6	3	25	30	13	2	5	34	5	18	23	2	15	262			
DNA = Tracking	1	2	15	2	3	1	1	3	10	2	1	14	22	2	1	0	15	1	17	21	1		135			
DNA Errors	0	17	11	1	1	2	5	5	16	4	2	11	8	11	1	5	19	4	1	2	1		127			
% DNA = Tracking	100%	11%	58%	67%	75%	33%	17%	38%	38%	33%	33%	56%	73%	15%	50%	0%	44%	20%	94%	91%	50%		52%			
DNA Stock Det'm Totals																										

TRACKING TOTALS

Table 14. Proportion of genetically identified Chinook that spawned in the expected geographic area.

	CLADE		STOCK	
	N	Y	N	Y
All Stocks	293	77.5%	262	51.5%
Babine	16	68.8%	19	10.5%
Bear	27	55.6%	26	57.7%
Gitnadoix	7	85.7%	6	16.7%
Kispiox	9	77.8%	8	37.5%
Kitwanga	30	73.3%	26	38.5%
Kalum	33	81.8%	25	56.0%
Morice	29	86.2%	30	73.3%
Otsi	16	68.8%	13	15.4%
Squingula	38	78.9%	34	44.1%
Sustut	22	100.0%	18	94.4%
Zymoetz	26	96.2%	23	91.3%

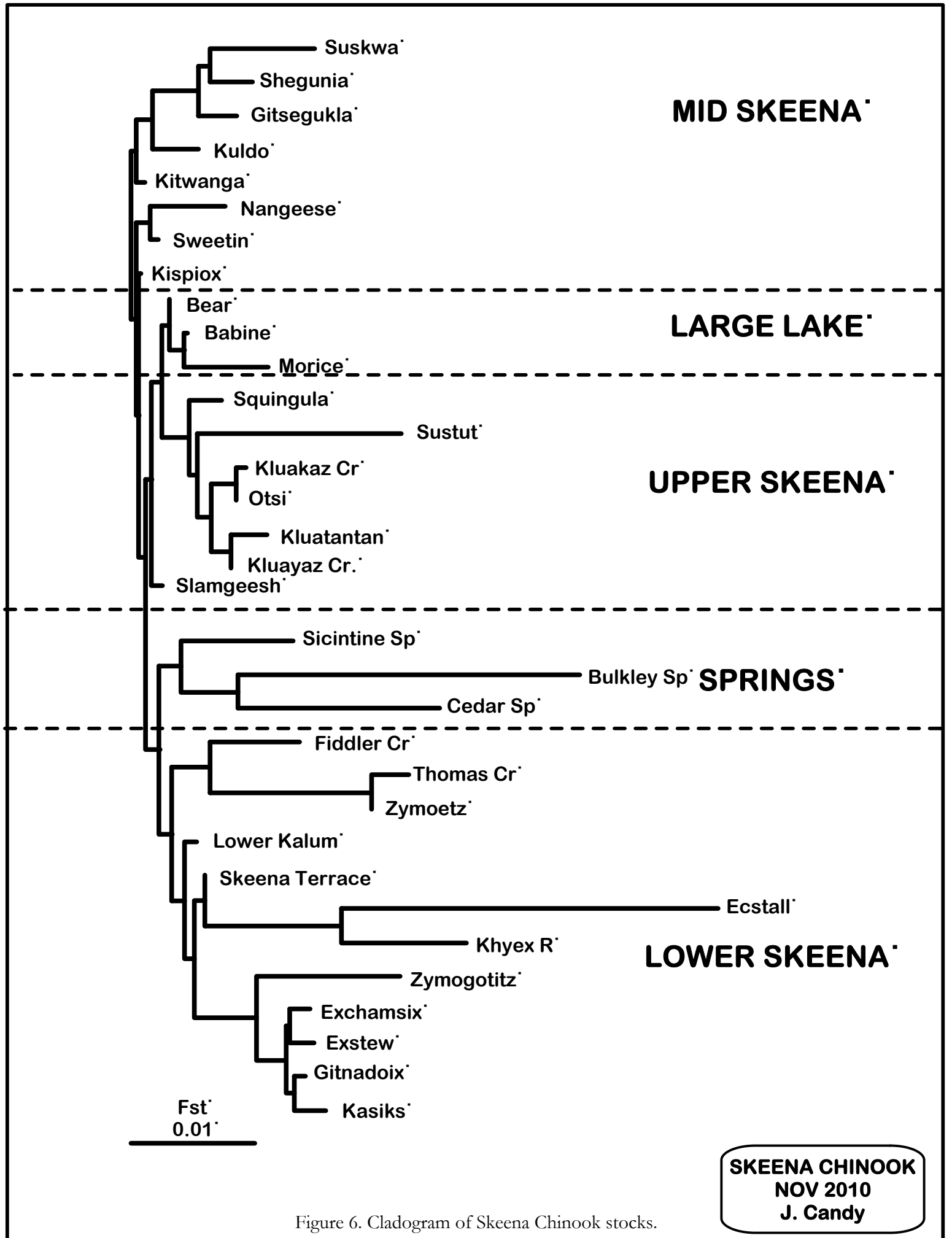
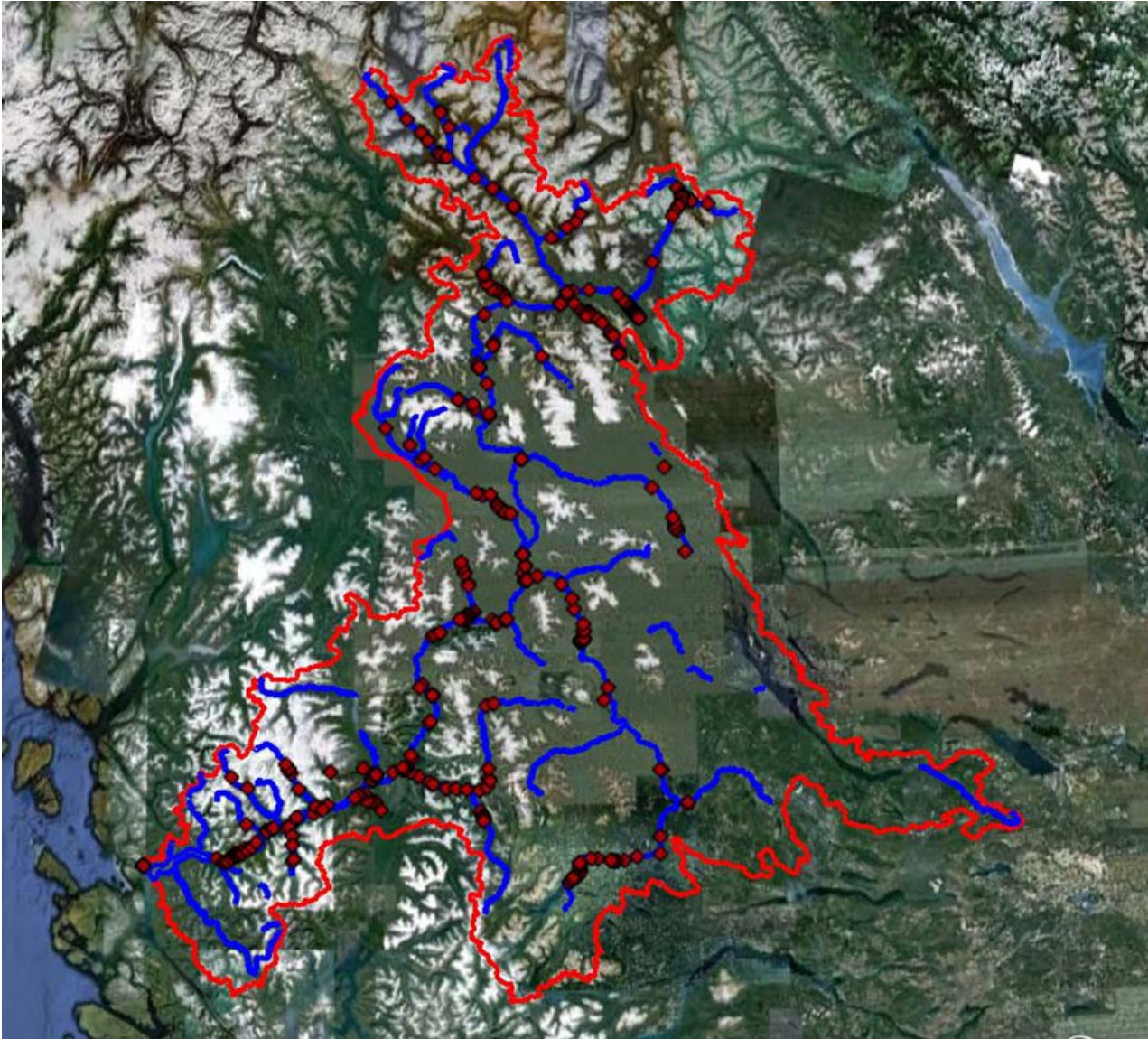


Figure 6. Cladogram of Skeena Chinook stocks.

Figure 7. Final position of Chinook tracked in the Skeena Watershed.



Discussion

The most striking finding of relocating Chinook is the extent of their distribution throughout the watershed. They are found both at known spawning areas and at various places downstream of known spawning areas. Most known spawning sites were examined, and Chinook were found at all of these locations. The distribution of migrants found during this study contributes to the developing understanding from population genetics (Gottesfeld 2010, Winther 2009, Winther and Candy 2010) that the Skeena Chinook are a diverse and widespread metapopulation and that the upper Skeena contains several large Chinook spawning and rearing areas.

Noteworthy for the lack of radio-tagged Chinook was the Telkwa River, a well known and productive steelhead and coho river. Three aerial surveys of the Telkwa were undertaken without finding adult Chinook. Furthermore, we surveyed the Telkwa River twice by beach seining in 2010 and found no juvenile Chinook.

Since 2007, Skeena Fisheries Commission has added several sites to the known Chinook spawning areas with adult and juvenile surveys at Kluayaz River, the Skeena River headwaters at Kluakaz Creek and Otsi Creek, Squingula River, and Kuldo Creek. New additions to the list of known spawning rivers are Mosque River, upstream of the Sustut, and the Nilkitkwa River, a major tributary of the Babine.

Another significant finding of this study was the relatively low number of tags tracked to the Kitsumkalum watershed. Prior to this study, Kitsumkalum Chinook spawners were believed to be far more abundant than those spawning in all other lower Skeena streams. In 2010, 20 radio-tagged Chinook were tracked to the Kitsumkalum watershed compared to 25 for the Zymoetz/Thomas watershed and the 20 tracked to other lower Skeena watersheds (Zymogotitz, Lakelse, Exstew, Gitnadoix, Exchamsiks and Kasiks).

Upstream migration is only the preliminary to breeding behaviour, and as we did not directly observe Chinook in spawning areas, we do not know what the Chinook were doing at their upstream limit of migration. As the mobile surveys were held late in the season, that is after the presumed peak of spawning and in part after completion of spawning, we favour the interpretation that a significant proportion of Chinook do not reach the appropriate spawning areas that they are presumably headed for. Of the 382 Chinook that were tagged and traced to an upstream position about 23% were not in their expected clade region and 30% were outside known or appropriate seeming spawning area. This constitutes a surprisingly high rate of in-transit losses. Similar rates of unsuccessful migration have however been noted for Taku River Chinook (Eiler 1995) and Fraser sockeye (Robichaud & English 2007, English 2010).

Another surprise of this study was the discrepancy between the radiotelemetry findings and the expectations based on DNA stock assignments. Of the Chinook that reached known spawning areas, only about 52% were in the expected one, that is the population with the highest probability in the assignment. This raises two possibilities, first that the DNA baseline assignments are suspect and second that Chinook that reach the wrong spawning areas have low reproductive effectiveness.

Of course these possibilities are not mutually exclusive. The reliability of the initial bayesian assignments after Pella and Masuda 2001 were investigated by John Candy of the DFO Salmon Genetics Laboratory (J. Candy 2011 pers. com.). He first assessed the reliability of the stock assignments based on the technique of Gelman & Rubin 1992. The internal consistency of stock assignments was then demonstrated by using two different mixture analysis approaches, CBAYES and ONCOR (Kay, Niu and Carmichael 2007). These evaluations support the rigor of the stock assignments and the utility of the Pella and Masuda technique and thus lend support towards the second possibility.

The proportions of stocks assigned to the various populations by microsatellite DNA (Table 12) include the joint probabilities of the first through fifth choices. These proportions of the stocks based on DNA assignments values are quite similar to the proportions of observed terminal locations of radio-tracked Chinook, and the scattered observations of escapements based on weir counts, mark and recapture experiments and visual estimates (Winther and Candy 2011, Gottesfeld 2011). The highest probabilities of assignment to stocks (Appendix I) range from 0.17 to 1.00 but 53% of the assignments have probabilities of >0.9. If we examine only the genetic assignments given high probabilities, the success rate for stock assignment improves somewhat but the disagreements do not disappear. That is to say we are having difficulties with individual assignments but if the sample is viewed *in toto*, the discrepancies are largely eliminated. This observation suggests that the errors in the various genetic assignments tend to be compensating.

It is apparent that there are considerable losses in transit and that many Chinook end up at unexpected spawning sites. The genetic evidence and radiotelemetry can be consistent if the stray Chinook have low breeding success. This requires that the effective population size is much smaller than the census size. Observations that the effective spawning population is only a fraction of the census population (=escapement) is thus to be expected. The likelihood of this being so has been pointed out in several studies of salmonid effective population size based on genetic changes through time using several techniques (Shrimpton & Heath 2003, Heath *et al.* 2002, Waples & Teel 1990, Williamson & Slatkin 1999 Jorde & Ryman 1996, Laikre *et al.* 1998) and analysis of family structure in wild populations (Jones & Hutchings 2002).

The overall success of microsatellite DNA in predicting the clade and stock assignments of tagged fish, however modest, supports the continued use of genetic analysis of representative samples of Skeena Chinook such as the Tye Test Fishery to determine escapements of the larger Skeena Chinook components. It is hoped that future increases in the baseline samples will enable better discrimination of populations. Studies of Chinook on the spawning grounds will clarify the question of the relationship between upstream migration success and reproductive contributions.

Chinook upriver travel seems fairly simple and uniform across stocks except for the behaviour at important junctions where Chinook that continued upstream in the tributary took more time choosing their direction than fish that took the larger branch. Similar observations were made during the 1992 and 1993 Nass Chinook radio-telemetry studies (Koski *et al.* 1996a, 1996b).

The migratory delays observed with radio-tagging were much more prominent at the lower Skeena site located at the freshwater end of the estuary than at the upriver Kuldo site. The proportions are indicative: nearly 90% of the tagged fish at the lower station dropped back for some period of time and 16% never came back upriver. The ability to detect downriver retreat of Kuldo-tagged fish was less as the downstream limiting station was much further away, however only 10% of the fish (12 of 119) dropped back downstream including two that went back up to die at known spawning sites in upper tributaries (one at Sustut River and one at Bear River), five that died at known spawning sites in lower tributaries (three at Kuldo Creek, one at Kispiox River and one at Babine River), and five that did not come back and likely did not die at a known spawning site. The more extreme reaction to capture and tagging of Chinook in the estuary likely relates to the osmoregulatory stress of fresh water entry. The strong reaction to the stress of gillnet capture and radio tag insertion tagging is no surprise when we compare it to the increased mortality evidence from fish wheel capture of chum on the Yukon River (Underwood 2004, Bromagin et al 2007) and the gillnet capture of sockeye (Baker & Schindler 2009).

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Appendices

Appendix 1. Genetic assignment probabilities for Radio tagged Chinook stock of origin.

Highest Probability Number	Highest Probability Proportion	Second Probability Number	Second Probability Proportion	Third Probability Number	Third Probability Proportion	Fourth Probability Number	Fourth Probability Proportion	Probability Number	Probability Proportion
21	4.72%	46	10.72%	44	10.76%	43	10.75%	46	11.83%
31	6.97%	39	9.09%	10	2.44%	24	6.00%	20	5.14%
4	0.90%	0	0.00%	0	0.00%	0	0.00%	1	0.26%
3	0.67%	2	0.47%	0	0.00%	3	0.75%	2	0.51%
0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
0	0.00%	2	0.47%	3	0.73%	3	0.75%	1	0.26%
7	1.57%	9	2.10%	5	1.22%	6	1.50%	6	1.54%
3	0.67%	1	0.23%	6	1.47%	3	0.75%	4	1.03%
10	2.25%	5	1.17%	10	2.44%	5	1.25%	7	1.80%
0	0.00%	0	0.00%	1	0.24%	2	0.50%	2	0.51%
0	0.00%	2	0.47%	3	0.73%	1	0.25%	1	0.26%
0	0.00%	0	0.00%	0	0.00%	0	0.00%	1	0.26%
9	2.02%	36	8.39%	32	7.82%	35	8.75%	29	7.46%
36	8.09%	39	9.09%	35	8.56%	40	10.00%	29	7.46%
0	0.00%	1	0.23%	6	1.47%	4	1.00%	8	2.06%
0	0.00%	0	0.00%	1	0.24%	2	0.50%	5	1.29%
11	2.47%	21	4.90%	30	7.33%	24	6.00%	26	6.68%
3	0.67%	9	2.10%	4	0.98%	11	2.75%	20	5.14%
43	9.66%	48	11.19%	30	7.33%	37	9.25%	14	3.60%
0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
109	24.49%	25	5.83%	26	6.36%	11	2.75%	7	1.80%
3	0.67%	6	1.40%	11	2.69%	9	2.25%	16	4.11%
17	3.82%	21	4.90%	24	5.87%	21	5.25%	20	5.14%
0	0.00%	0	0.00%	1	0.24%	0	0.00%	3	0.77%
6	1.35%	6	1.40%	9	2.20%	5	1.25%	11	2.83%
0	0.00%	3	0.70%	4	0.98%	3	0.75%	10	2.57%
8	1.80%	25	5.83%	22	5.38%	37	9.25%	29	7.46%
46	10.34%	31	7.23%	43	10.51%	32	8.00%	24	6.17%
11	2.47%	6	1.40%	10	2.44%	4	1.00%	6	1.54%
26	5.84%	3	0.70%	1	0.24%	7	1.75%	3	0.77%
0	0.00%	0	0.00%	14	3.42%	4	1.00%	11	2.83%
25	5.62%	10	2.33%	4	0.98%	9	2.25%	5	1.29%
9	2.02%	29	6.76%	19	4.65%	13	3.25%	17	4.37%
4	0.90%	4	0.93%	1	0.24%	2	0.50%	5	1.29%

APPENDIX II

Final Radiotelemetry Locations and Genertic Stock Determinations for Skeena Radiotagged Chinook

Fish Number	Tagging Site	Final RadioTelemetry Location	DNA Stock Highest Probability	First Probability	DNA Stock Second Probability	Second Probability	Stock Third Probability	Third Probability	DNA Stock Fourth Probability	Fourth Probability	Stock Fifth Probability	Fifth Probability
4	Kwinitsa	MOB - Skeena - Salvus to Remo	Cedar_sp	0.91	L_Kalum	0.05	Kitwanga	0.02	Kuldo	0.00	Gitnadoix	0.00
5	Kwinitsa	Bulkley River and watershed	Bulkley_sp	0.42	Morice	0.29	Babine	0.09	Kuldo	0.05	Slamgeesh	0.03
6	Kwinitsa	Remo	Sustut	1.00	Babine	0.00	Morice	0.00	Kluayaz_Cr	0.00		
7	Kwinitsa	Kalum Mouth	Cedar_sp	0.94	Zymogotitz	0.05	Babine	0.01	Kispiox	0.00	Bear	0.00
10	Kwinitsa	MOB - Skeena - Zymoetz River to Oliver Creek	Kluayaz_Cr	0.61	Kitwanga	0.30	L_Kalum	0.05	Fiddler_Cr	0.01	Squingula	0.01
11	Kwinitsa	Suskwa River and watershed	Suskwa	0.97	Morice	0.02	L_Kalum	0.01	Kispiox	0.00	Kitwanga	0.00
12	Kwinitsa	MOB - Upper Bulkley River and watershed	Bulkley_sp	1.00								
13	Kwinitsa	MOB - Skeena - Oliver Creek to Kitwanga River	Kitwanga	0.83	Suskwa	0.14	Kispiox	0.02	Kluayaz_Cr	0.00	Bear	0.00
15	Kwinitsa	Skeena - Bulkley River to Kispiox River	Morice	0.98	L_Kalum	0.01	Sweetin	0.00	Babine	0.00	Nangeese_R	0.00
16	Kwinitsa	River above fence	Kitwanga	0.90	Kispiox	0.07	Suskwa	0.01	L_Kalum	0.01	Babine	0.00
18	Kwinitsa	MOB - Bulkley - Suskwa River to Telkwa River	Gitnadoix	0.59	Nangeese_R	0.12	Morice	0.07	Thomas_Cr	0.06	Kluayaz_Cr	0.06
20	Kwinitsa	Skeena - Zymoetz River to Oliver Creek	Bulkley_sp	1.00								
21	Kwinitsa	Skeena - Salvus to Remo	Kitwanga	0.70	Morice	0.23	L_Kalum	0.05	Kispiox	0.02	Kuldo	0.00

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Final Radiotelemetry Locations and Genetic Stock Determinations for Skeena Radiotagged Chinook

Fish Number	Tagging Site	Final RadioTelemetry Location	DNA Stock Highest Probability	First Probability	DNA Stock Second Probability	Second Probability	Stock Third Probability	Third Probability	DNA Stock Fourth Probability	Fourth Probability	Stock Fifth Probability	Fifth Probability
22	Kwinitsa	MOB - Zymoetz River downstream of Clore junction	Kitwanga	0.55	Kuldo	0.24	Kispiox	0.10	Suskwa	0.03	L_Kalum	0.03
26	Kwinitsa	MOB - Mosque River and watershed	Squingula	0.95	Kuldo	0.04	Babine	0.00	L_Kalum	0.00	Nangeese_R	0.00
28	Kwinitsa	MOB - Sweetin and Nangeese rivers & watersheds	Zymoetz	0.81	Slamgeesh	0.13	Thomas_Cr	0.02	Kitwanga	0.01	Sweetin	0.01
30	Kwinitsa	MOB - Sustut River upstream of Asitka River	Sustut	0.42	Kitwanga	0.31	L_Kalum	0.24	Kluayaz_Cr	0.02	Zymoetz	0.01
31	Kwinitsa	MOB - Exstew River and watershed	Exstew	0.75	Gitnadoix	0.24	Exchamsiks	0.00	L_Kalum	0.00	Zymoetz	0.00
32	Kwinitsa	MOB - Slamgeesh River and watershed	L_Kalum	0.71	Squingula	0.11	Kitwanga	0.06	Exstew	0.04	Slamgeesh	0.02
33	Kwinitsa	Sicintine Junction	L_Kalum	0.65	Kitwanga	0.32	Skeena @Terrace	0.01	Otsi	0.00	Bear	0.00
34	Kwinitsa	MOB - Skeena - Slamgeesh River to Squingula River	Kitwanga	0.95	Suskwa	0.02	Slamgeesh	0.01	L_Kalum	0.01	Kuldo	0.01
36	Kwinitsa	MOB - Skeena - Kluatantan River to headwaters	Kluayaz_Cr	0.38	Slamgeesh	0.24	Kitwanga	0.23	L_Kalum	0.12	Otsi	0.01
37	Kwinitsa	Kispiox	Squingula	0.34	Slamgeesh	0.32	Morice	0.12	Babine	0.12	Kispiox	0.03
38	Kwinitsa	MOB - Clore River and watershed	Zymoetz	0.81	Thomas_Cr	0.16	Squingula	0.01	Exstew	0.00	Kispiox	0.00

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Final Radiotelemetry Locations and Genertic Stock Determinations for Skeena Radiotagged Chinook

Fish Number	Tagging Site	Final RadioTelemetry Location	DNA Stock Highest Probability	First Probability	DNA Stock Second Probability	Second Probability	Stock Third Probability	Third Probability	DNA Stock Fourth Probability	Fourth Probability	Stock Fifth Probability	Fifth Probability
39	Kwinitisa	MOB - Kispiox River to Sweetin junction	Kitwanga	0.40	Suskwa	0.25	Zymoetz	0.20	Kuldo	0.05	Kispiox	0.02
40	Kwinitisa	Oliver Creek	Morice	0.66	L_Kalum	0.17	Squingula	0.09	Slamgeesh	0.03	Kispiox	0.02
41	Kwinitisa	MOB - Sustut River upstream of Asitka River	Sustut	0.72	Kluayaz_Cr	0.19	Otsi	0.05	Squingula	0.01	Morice	0.01
42	Kwinitisa	Skeena - Kitsequecla River to Bulkley River	Suskwa	0.73	Kispiox	0.17	Kitwanga	0.05	Nangeese_R	0.01	Slamgeesh	0.01
43	Kwinitisa	Skeena - Tagging Site to Salvus	Morice	1.00	Babine	0.00						
44	Kwinitisa	MOB - Skeena - Sustut River to Kluatantan River	Squingula	0.22	Kispiox	0.18	L_Kalum	0.11	Kuldo	0.10	Otsi	0.05
45	Kwinitisa	MOB - Skeena - Kitwanga River to Kitsequecla River	Suskwa	0.90	Kispiox	0.08	Sweetin	0.01	Kitwanga	0.00	Gitsegukla	0.00
46	Kwinitisa	MOB - Downstream of Scuttsap	Cedar_sp	0.87	Kitwanga	0.05	Slamgeesh	0.04	Kispiox	0.02	Kuldo	0.01
47	Kwinitisa	MOB - Exstew River and watershed	Gitnadoix	0.70	Morice	0.21	Kitwanga	0.05	Squingula	0.02	Exstew	0.02
48	Kwinitisa	MOB - Bear River to Lake	Sicintine-Sp	0.87	Slamgeesh	0.09	Morice	0.03	Kispiox	0.01	Nangeese_R	0.00
49	Kwinitisa	MOB - Zymoetz River downstream of Clore junction	Thomas_Cr	0.98	Zymoetz	0.02	Kitwanga	0.00	L_Kalum	0.00	Exstew	0.00
53	Kwinitisa	Remo	Kitwanga	0.60	L_Kalum	0.34	Kispiox	0.03	Slamgeesh	0.01	Babine	0.01

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Final Radiotelemetry Locations and Genetic Stock Determinations for Skeena Radiotagged Chinook

Fish Number	Tagging Site	Final RadioTelemetry Location	DNA Stock Highest Probability	First Probability	DNA Stock Second Probability	Second Probability	Stock Third Probability	Third Probability	DNA Stock Fourth Probability	Fourth Probability	Stock Fifth Probability	Fifth Probability
54	Kwinitsa	MOB - Sustut River upstream of Asitka River	Sustut	1.00	Kispiox	0.00	Kitwanga	0.00	Zymoetz	0.00	L_Kalum	0.00
57	Kwinitsa	MOB - Kitwanga River above fence	Kispiox	0.43	L_Kalum	0.24	Shequina	0.10	Kitwanga	0.10	Sweetin	0.03
58	Kwinitsa	Scuttsap	Sicintine-Sp	0.20	Kitwanga	0.18	Otsi	0.15	Babine	0.13	Morice	0.10
60	Kwinitsa	Kalum Mouth	Kitwanga	0.46	L_Kalum	0.12	Morice	0.12	Slamgeesh	0.11	Cedar_sp	0.05
61	Kwinitsa	Remo	Suskwa	0.90	Slamgeesh	0.04	Babine	0.02	Squingula	0.02	Zymoetz	0.01
62	Kwinitsa	MOB - Downstream of Scuttsap	Sicintine-Sp	0.71	Squingula	0.07	Kluayaz_Cr	0.06	Kispiox	0.06	Slamgeesh	0.05
63	Kwinitsa	MOB - Sustut - Skeena River to Bear River	Sustut	0.99	Squingula	0.01	Morice	0.00	Kispiox	0.00	Kitwanga	0.00
64	Kwinitsa	MOB - Morice - Fixed-station Rx to Thautil River	Bulkley_sp	1.00								
65	Kwinitsa	Bulkley - Suskwa River to Telkwa River	Morice	0.78	Kitwanga	0.12	L_Kalum	0.05	Slamgeesh	0.03	Kuldo	0.01
66	Kwinitsa	Salvus	Zymogotitz	0.44	Exstew	0.36	Kitwanga	0.18	Nangeese_R	0.01	Gitnadoix	0.01
67	Kwinitsa	Scuttsap	Morice	1.00								
68	Kwinitsa	Scuttsap	Morice	1.00	Babine	0.00						
69	Kwinitsa	MOB - Babine River - upstream of fence	Babine	0.26	Kitwanga	0.22	Kispiox	0.11	L_Kalum	0.10	Fiddler_Cr	0.06
70	Kwinitsa	MOB - Zymoetz River upstream of Clore junction	Thomas_Cr	0.95	L_Kalum	0.04	Zymoetz	0.01	Kitwanga	0.00	Skeena @Terrace	0.00

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Final Radiotelemetry Locations and Genertic Stock Determinations for Skeena Radiotagged Chinook

Fish Number	Tagging Site	Final RadioTelemetry Location	DNA Stock Highest Probability	First Probability	DNA Stock Second Probability	Second Probability	Stock Third Probability	Third Probability	DNA Stock Fourth Probability	Fourth Probability	Stock Fifth Probability	Fifth Probability
71	Kwinitisa	MOB - Nilkitkwa River watershed	Squingula	0.82	L_Kalum	0.07	Bear	0.07	Slamgeesh	0.02	Babine	0.01
72	Kwinitisa	Oliver Creek	Morice	0.95	Kitwanga	0.03	Slamgeesh	0.01	Kispiox	0.01	Babine	0.00
73	Kwinitisa	Downstream of Scuttsap	Gitnadoix	0.46	L_Kalum	0.44	Kispiox	0.05	Thomas_Cr	0.02	Kitwanga	0.02
74	Kwinitisa	Zymoetz River	Morice	1.00	L_Kalum	0.00	Babine	0.00				
75	Kwinitisa	MOB - Sustut River upstream of Asitka River	Sustut	0.99	Squingula	0.01	Kluayaz_Cr	0.00				
76	Kwinitisa	Scuttsap	Morice	0.50	L_Kalum	0.40	Babine	0.08	Kitwanga	0.00	Skeena @Terrace	0.00
77	Kwinitisa	MOB - Zymoetz River upstream of Clore junction	Thomas_Cr	0.71	Zymoetz	0.29	Suskwa	0.00				
78	Kwinitisa	Bulkley - Suskwa River to Telkwa River	Morice	1.00	Babine	0.00						
79	Kwinitisa	Oliver Creek	Suskwa	0.39	Nangeese_R	0.16	Morice	0.11	Kispiox	0.08	Kitwanga	0.06
80	Kwinitisa	MOB - Lower Squingula River	Squingula	0.93	Morice	0.03	Nangeese_R	0.02	Kispiox	0.02	Otsi	0.00
81	Kwinitisa	Bulkley Junction	Morice	0.86	Kispiox	0.10	Bear	0.02	Squingula	0.01	Zymoetz	0.00
82	Kwinitisa	Scuttsap	Morice	0.94	Kispiox	0.04	Slamgeesh	0.01	L_Kalum	0.00	Kitwanga	0.00
83	Kwinitisa	Kitwanga River to fence	Kitwanga	0.73	Suskwa	0.14	Nangeese_R	0.04	Slamgeesh	0.03	Babine	0.02
84	Kwinitisa	Clore River and watershed	Thomas_Cr	0.57	Zymoetz	0.40	Morice	0.01	L_Kalum	0.01	Squingula	0.01
85	Kwinitisa	Downstream of Scuttsap	Slamgeesh	0.40	Morice	0.29	Squingula	0.08	Kitwanga	0.08	Kluayaz_Cr	0.04
86	Kwinitisa	Scuttsap	Slamgeesh	0.22	Kitwanga	0.17	Squingula	0.17	Kispiox	0.15	Kuldo	0.12

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Fish Number	Tagging Site	Final RadioTelemetry Location	DNA Stock Highest Probability	First Probability	DNA Stock Second Probability	Second Probability	Stock Third Probability	Third Probability	DNA Stock Fourth Probability	Fourth Probability	Stock Fifth Probability	Fifth Probability
87	Kwinitsa	MOB - Zymoetz River upstream of Clore junction	Thomas_Cr	0.91	L_Kalum	0.04	Morice	0.02	Kitwanga	0.01	Zymoetz	0.01
88	Kwinitsa	Skeena - Zymoetz River to Oliver Creek	Zymoetz	0.86	Cedar_sp	0.09	Morice	0.03	Kispiox	0.01	Kitwanga	0.01
89	Kwinitsa	Bulkley - Suskwa River to Telkwa River	Morice	0.89	Slamgeesh	0.06	Kitwanga	0.02	Kispiox	0.01	Kuldo	0.01
90	Kwinitsa	MOB - Exstew River and watershed	Squingula	0.78	Exstew	0.08	Kitwanga	0.08	Otsi	0.01	L_Kalum	0.01
92	Kwinitsa	Skeena - Kitwanga River to Kitsequecla River	Kitwanga	0.36	Kispiox	0.25	Suskwa	0.11	Babine	0.10	Nangeese_R	0.03
93	Kwinitsa	Kalum Mouth	Thomas_Cr	0.38	Cedar_sp	0.35	L_Kalum	0.08	Babine	0.08	Kitwanga	0.05
94	Kwinitsa	Scuttsap	Morice	0.96	Babine	0.02	Slamgeesh	0.01	Bear	0.00	Kuldo	0.00
95	Kwinitsa	Remo	Morice	0.81	Kitwanga	0.07	L_Kalum	0.06	Kispiox	0.01	Skeena@Terrace	0.01
96	Kwinitsa	MOB - Bulkley - Suskwa River to Telkwa River	Morice	0.94	Slamgeesh	0.02	Zymoetz	0.01	Thomas_Cr	0.01	Kispiox	0.01
97	Kwinitsa	MOB - Kispiox River to Sweetin junction	Kitwanga	0.63	Kispiox	0.14	Babine	0.12	L_Kalum	0.10	Morice	0.00
98	Kwinitsa	Zymoetz River	Thomas_Cr	0.99	Zymoetz	0.01	L_Kalum	0.00				
99	Kwinitsa	MOB - Downstream of Scuttsap	Gitnadoix	0.71	Exstew	0.29	L_Kalum	0.00	Skeena@Terrace	0.00		

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Fish Number	Tagging Site	Final RadioTelemetry Location	DNA Stock Highest Probability	First Probability	DNA Stock Second Probability	Second Probability	Stock Third Probability	Third Probability	DNA Stock Fourth Probability	Fourth Probability	Stock Fifth Probability	Fifth Probability
100	Kwinitsa	MOB - Downstream of Scuttsap	L_Kalum	0.41	Kitwanga	0.23	Babine	0.10	Morice	0.10	Slamgeesh	0.06
101	Kwinitsa	Scuttsap	Zymogotitz	0.75	Kitwanga	0.21	Gitnadoix	0.01	Kispiox	0.01	Exstew	0.01
102	Kwinitsa	Scuttsap	Morice	0.77	Kluayaz_Cr	0.10	Slamgeesh	0.09	Fiddler_Cr	0.01	Nangeese_R	0.01
103	Kwinitsa	Remo	Morice	0.98	Kispiox	0.01	Thomas_Cr	0.00	Zymoetz	0.00	L_Kalum	0.00
104	Kwinitsa	Scuttsap	Morice	0.87	L_Kalum	0.09	Squingula	0.01	Kitwanga	0.01	Kuldo	0.01
105	Kwinitsa	Salvus	Sicintine-Sp	0.70	Squingula	0.24	Otsi	0.03	Babine	0.01	Kispiox	0.01
106	Kwinitsa	MOB - Kispiox River to Sweetin junction	Nangeese_R	0.32	Slamgeesh	0.20	Squingula	0.20	Kitwanga	0.09	Kuldo	0.08
107	Kwinitsa	MOB - Kispiox River to Sweetin junction	Kitwanga	0.63	Slamgeesh	0.19	Zymoetz	0.12	Kispiox	0.04	L_Kalum	0.00
108	Kwinitsa	Scuttsap	Thomas_Cr	0.89	Zymoetz	0.09	L_Kalum	0.01	Morice	0.01	Suskwa	0.00
109	Kwinitsa	MOB - Lower Squingula River	Squingula	0.89	Kluayaz_Cr	0.08	Sicintine-Sp	0.01	Kispiox	0.01	L_Kalum	0.01
110	Kwinitsa	MOB - Skeena - Scuttsap to Tagging site	Squingula	0.61	Kuldo	0.18	Slamgeesh	0.04	Kluayaz_Cr	0.04	Kispiox	0.03
111	Kwinitsa	MOB - Lakelse River and watershed	Exstew	0.59	Kitwanga	0.12	Gitnadoix	0.11	Kispiox	0.05	Sweetin	0.04
112	Kwinitsa	Bulkley - Suskwa River to Telkwa River	Squingula	0.27	Kitwanga	0.15	Sustut	0.12	Kluatanta_n	0.11	Slamgeesh	0.11
113	Kwinitsa	MOB - Zymagotitz River and watershed	Zymogotitz	0.75	Exstew	0.10	Gitnadoix	0.05	Kitwanga	0.04	Kispiox	0.03

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Fish Number	Tagging Site	Final RadioTelemetry Location	DNA Stock Highest Probability	First Probability	DNA Stock Second Probability	Second Probability	Stock Third Probability	Third Probability	DNA Stock Fourth Probability	Fourth Probability	Stock Fifth Probability	Fifth Probability
114	Kwinitsa	Skeena - Remo to Kalum River	Squingula	0.96	Kitwanga	0.02	Kluayaz_Cr	0.01	Babine	0.00	Kispiox	0.00
115	Kwinitsa	Downstream of Scuttsap	Thomas_Cr	0.98	Zymoetz	0.01	L_Kalum	0.01	Kitwanga	0.00	Bear	0.00
116	Kwinitsa	MOB - Fiddler Creek	Fiddler_Cr	0.61	Kuldo	0.26	Kispiox	0.03	Slamgeesh	0.03	Zymoetz	0.02
117	Kwinitsa	Scuttsap	Suskwa	0.99	L_Kalum	0.00	Morice	0.00	Kitwanga	0.00	Kispiox	0.00
118	Kwinitsa	MOB - Sustut River upstream of Asitka River	Sustut	1.00								
119	Kwinitsa	Scuttsap	Sustut	0.90	Kispiox	0.05	Kluayaz_Cr	0.02	Kitwanga	0.02	Otsi	0.00
120	Kwinitsa	Kalum Mouth	Slamgeesh	0.63	Kluayaz_Cr	0.08	Nangeese_R	0.06	Morice	0.05	L_Kalum	0.04
121	Kwinitsa	MOB - Bulkley - Telkwa River to Morice River	Morice	0.94	Kitwanga	0.04	L_Kalum	0.01	Babine	0.01	Thomas_Cr	0.00
122	Kwinitsa	Skeena - Oliver Creek to Kitwanga River	Kitwanga	0.40	Morice	0.32	Kispiox	0.10	Kluayaz_Cr	0.08	Zymoetz	0.04
123	Kwinitsa	MOB - Kitwanga River to fence	Kitwanga	0.74	Slamgeesh	0.09	Babine	0.06	Gitsegukla	0.05	L_Kalum	0.03
124	Kwinitsa	MOB - Morice - Thautil River to Morice Lake	Morice	1.00	Zymoetz	0.00	Babine	0.00	Kitwanga	0.00	Slamgeesh	0.00
125	Kwinitsa	MOB - Downstream of Scuttsap	Sicintine-Sp	1.00	Zymoetz	0.00						
126	Kwinitsa	Downstream of Scuttsap	Kispiox	0.41	Kitwanga	0.27	Otsi	0.13	Zymoetz	0.08	Nangeese_R	0.03
127	Kwinitsa	Zymoetz River	Thomas_Cr	0.72	Zymoetz	0.27	Gitnadoix	0.00	Squingula	0.00	Suskwa	0.00
128	Kwinitsa	Scuttsap	Zymoetz	0.81	Thomas_Cr	0.18	L_Kalum	0.01	Kuldo	0.00	Kispiox	0.00

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Fish Number	Tagging Site	Final RadioTelemetry Location	DNA Stock Highest Probability	First Probability	DNA Stock Second Probability	Second Probability	Stock Third Probability	Third Probability	DNA Stock Fourth Probability	Fourth Probability	Stock Fifth Probability	Fifth Probability
129	Kwinitsa	Kalum Mouth	L_Kalum	0.42	Kitwanga	0.26	Morice	0.09	Nangeese_R	0.05	Babine	0.03
130	Kwinitsa	Salvus	Exstew	0.33	Zymogotitz	0.32	Gitnadoix	0.29	Exchamsiks	0.03	Thomas_Cr	0.01
131	Kwinitsa	Downstream of Scuttsap	Morice	0.98	Babine	0.01	Squingula	0.00	Slamgeesh	0.00		
132	Kwinitsa	Downstream of Scuttsap	Morice	0.97	L_Kalum	0.03	Slamgeesh	0.00	Kispiox	0.00	Babine	0.00
133	Kwinitsa	MOB - Kitwanga River above fence	Nangeese_R	0.39	Kispiox	0.39	Kitwanga	0.12	Slamgeesh	0.08	Zymoetz	0.01
134	Kwinitsa	MOB - Lower Squingula River	Squingula	0.78	Kispiox	0.07	Kitwanga	0.06	L_Kalum	0.03	Otsi	0.02
135	Kwinitsa	MOB - Morice - Fixed-station Rx to Thautil River	Morice	1.00	Babine	0.00						
136	Kwinitsa	MOB - Kispiox River to Sweetin junction	L_Kalum	0.99	Kasiks	0.00	Babine	0.00	Kispiox	0.00	Exstew	0.00
137	Kwinitsa	Salvus	Exstew	1.00	Kitwanga	0.00	Exchamsiks	0.00	L_Kalum	0.00		
138	Kwinitsa	MOB - Kitwanga River above fence	Kitwanga	0.21	Squingula	0.16	Kispiox	0.15	Kluayaz_Cr	0.09	Otsi	0.06
139	Kwinitsa	MOB - Kitwanga River to fence	Kitwanga	0.49	Fiddler_Cr	0.23	Nangeese_R	0.08	Exstew	0.05	Sweetin	0.05
140	Kwinitsa	MOB - Bulkley - Telkwa River to Morice River	Kispiox	0.44	Nangeese_R	0.27	L_Kalum	0.11	Slamgeesh	0.03	Kitwanga	0.02
141	Kwinitsa	MOB - Sweetin and Nangeese rivers & watersheds	Kitwanga	0.75	Kispiox	0.10	Slamgeesh	0.07	Otsi	0.06	Babine	0.01
142	Kwinitsa	Downstream of Scuttsap	L_Kalum	0.95	Kitwanga	0.02	Morice	0.01	Slamgeesh	0.00	Squingula	0.00

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Fish Number	Tagging Site	Final RadioTelemetry Location	DNA Stock Highest Probability	First Probability	DNA Stock Second Probability	Second Probability	Stock Third Probability	Third Probability	DNA Stock Fourth Probability	Fourth Probability	Stock Fifth Probability	Fifth Probability
143	Kwinitsa	MOB - Exchamsiks River and watershed	Morice	0.56	Gitnadoix	0.25	Babine	0.09	Thomas_Cr	0.04	Suskwa	0.03
144	Kwinitsa	MOB - Kuldo Creek and watershed	Kuldo	0.72	Kispiox	0.08	Nangeese_R	0.06	L_Kalum	0.06	Kitwanga	0.04
145	Kwinitsa	MOB - Upper Squingula River - Motase Lake outlet	Sqingula	0.84	Morice	0.07	Sicintine-Sp	0.04	Kitwanga	0.02	Otsi	0.01
146	Kwinitsa	MOB - Clore River and watershed	Thomas_Cr	0.96	L_Kalum	0.02	Zymoetz	0.01	Kitwanga	0.00	Slamgeesh	0.00
147	Kwinitsa	MOB - Kitwanga River to fence	Morice	0.93	Kitwanga	0.03	L_Kalum	0.03	Kispiox	0.01	Zymoetz	0.00
148	Kwinitsa	MOB - Kitwanga River to fence	Kitwanga	0.88	Kispiox	0.05	Kuldo	0.03	Nangeese_R	0.02	Gitsegukla	0.00
149	Kwinitsa	Scuttsap	Kitwanga	0.73	Kispiox	0.13	Babine	0.08	Slamgeesh	0.05	Sqingula	0.01
150	Kwinitsa	MOB - Kispiox River to Sweetin junction	Kispiox	0.45	Suskwa	0.14	Morice	0.13	Slamgeesh	0.12	Babine	0.04
151	Kwinitsa	MOB - Bulkley - Suskwa River to Telkwa River	Morice	0.99	Sicintine-Sp	0.00	Babine	0.00	Suskwa	0.00	Kispiox	0.00
152	Kwinitsa	Zymoetz River	Thomas_Cr	0.59	Zymoetz	0.19	Babine	0.06	L_Kalum	0.05	Kitwanga	0.03
153	Kwinitsa	Kispiox	Sqingula	0.76	Kitwanga	0.07	Otsi	0.04	L_Kalum	0.04	Kispiox	0.03
154	Kwinitsa	MOB - Skeena - Salvus to Remo	Morice	0.31	Sqingula	0.19	Kuldo	0.14	Kitwanga	0.11	Babine	0.04
155	Kwinitsa	Zymoetz River	Zymoetz	0.52	Thomas_Cr	0.46	Morice	0.01	L_Kalum	0.00	Skeena @Terrace	0.00

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Fish Number	Tagging Site	Final RadioTelemetry Location	DNA Stock Highest Probability	First Probability	DNA Stock Second Probability	Second Probability	Stock Third Probability	Third Probability	DNA Stock Fourth Probability	Fourth Probability	Stock Fifth Probability	Fifth Probability
156	Kwinitisa	Scuttsap	Thomas_Cr	0.72	Zymoetz	0.26	Kitwanga	0.01	Suskwa	0.01	Kispiox	0.00
157	Kwinitisa	Kispiox	Morice	0.96	Slamgeesh	0.03	Otsi	0.00	Babine	0.00	Kispiox	0.00
158	Kwinitisa	MOB - Lower Squingula River	Sqingula	0.71	Kluayaz_Cr	0.22	Babine	0.02	Bear	0.01	Kluatanta n	0.01
159	Kwinitisa	MOB - Gitnadoix River and watershed	Suskwa	0.59	L_Kalum	0.25	Babine	0.04	Sqingula	0.03	Zymogotit z	0.02
160	Kwinitisa	MOB - Skeena - Salvus to Remo	L_Kalum	0.92	Exstew	0.03	Suskwa	0.02	Gitnadoix	0.02	Kitwanga	0.00
161	Kwinitisa	Release - LR	Morice	1.00	L_Kalum	0.00	Sqingul a	0.00	Kispiox	0.00	Babine	0.00
162	Kwinitisa	Kalum Mouth	L_Kalum	0.96	Kasiks	0.04	Gitnadoi x	0.00	Babine	0.00	Zymoetz	0.00
163	Kwinitisa	MOB - Skeena - Oliver Creek to Kitwanga River	Kluayaz_Cr	0.73	Sqingula	0.27	Kluakaz_ Cr	0.00	Kitwanga	0.00	Otsi	0.00
164	Kwinitisa	MOB - Gitnadoix River and watershed	Kitwanga	0.28	Gitnadoix	0.24	Exstew	0.23	Morice	0.08	Skeena @Terrac e	0.04
165	Kwinitisa	MOB - Kasiks River and watershed	Gitnadoix	0.62	Exstew	0.37	Kasiks	0.01	Exchamsi ks	0.00	Zymogotit z	0.00
166	Kwinitisa	MOB - Zymoetz River downstream of Clore junction	Thomas_Cr	0.85	Zymoetz	0.14	Kitwanga	0.00	Suskwa	0.00	Babine	0.00
167	Kwinitisa	Salvus	Morice	0.60	Slamgeesh	0.38	Babine	0.00	Kispiox	0.00	Sqingul a	0.00
168	Kwinitisa	MOB - Bulkley - Suskwa River to Telkwa River	Morice	0.98	Kluayaz_Cr	0.01	Babine	0.00	Slamgees h	0.00	Kluatanta n	0.00
169	Kwinitisa	MOB - Slamgeesh River and watershed	Sqingula	0.88	Morice	0.08	Slamgee sh	0.01	Babine	0.01	Kispiox	0.01

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Final Radiotelemetry Locations and Genertic Stock Determinations for Skeena Radiotagged Chinook

Fish Number	Tagging Site	Final RadioTelemetry Location	DNA Stock Highest Probability	First Probability	DNA Stock Second Probability	Second Probability	Stock Third Probability	Third Probability	DNA Stock Fourth Probability	Fourth Probability	Stock Fifth Probability	Fifth Probability
170	Kwinitisa	MOB - Zymoetz River downstream of Clore junction	Zymoetz	0.48	Thomas_Cr	0.26	Morice	0.14	L_Kalum	0.04	Babine	0.04
171	Kwinitisa	Release - LR	Kitwanga	0.95	Kispiox	0.05	Nangeese_R	0.00	L_Kalum	0.00	Zymogotitz	0.00
172	Kwinitisa	MOB - Zymoetz River upstream of Clore junction	Thomas_Cr	0.98	L_Kalum	0.01	Zymoetz	0.01	Nangeese_R	0.00	Bear	0.00
173	Kwinitisa	MOB - Gitnadoix River and watershed	Kitwanga	0.61	Morice	0.19	Kispiox	0.09	Gitnadoix	0.07	L_Kalum	0.01
174	Kwinitisa	MOB - Kispiox River to Sweetin junction	Kuldo	0.43	Kitwanga	0.31	Kispiox	0.22	L_Kalum	0.01	Babine	0.01
175	Kwinitisa	MOB - Kitwanga River above fence	Kitwanga	0.53	Kispiox	0.28	Gitnadoix	0.06	Bear	0.05	Squingula	0.02
176	Kwinitisa	MOB - Morice Lake and watershed	Morice	1.00	Babine	0.00						
177	Kwinitisa	MOB - Kitwanga River above fence	Kispiox	0.46	Kitwanga	0.22	Nangeese_R	0.14	Cedar_sp	0.10	Suskwa	0.03
178	Kwinitisa	Skeena - Bulkley River to Kispiox River	Kitwanga	0.85	Kispiox	0.13	Slamgeesh	0.01	Squingula	0.00	Kluayaz_Cr	0.00
179	Kwinitisa	MOB - Bear River to Lake	L_Kalum	0.61	Kitwanga	0.16	Squingula	0.09	Babine	0.06	Slamgeesh	0.04
180	Kwinitisa	Babine - downstream of fence	Kuldo	0.54	Squingula	0.20	Kispiox	0.12	Kitwanga	0.04	Babine	0.04
181	Kwinitisa	Bulkley - Suskwa River to Telkwa River	Morice	1.00	Bear	0.00	Babine	0.00	Slamgeesh	0.00	Squingula	0.00

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Final Radiotelemetry Locations and Genetic Stock Determinations for Skeena Radiotagged Chinook

Fish Number	Tagging Site	Final RadioTelemetry Location	DNA Stock Highest Probability	First Probability	DNA Stock Second Probability	Second Probability	Stock Third Probability	Third Probability	DNA Stock Fourth Probability	Fourth Probability	Stock Fifth Probability	Fifth Probability
182	Kwinitsa	MOB - Exstew River and watershed	Exstew	0.87	Morice	0.06	Gitnadoix	0.04	Kitwanga	0.02	Babine	0.01
183	Kwinitsa	MOB - Morice - Thautil River to Morice Lake	Morice	0.98	Babine	0.01	Kitwanga	0.00	Slamgeesh	0.00	Bear	0.00
184	Kwinitsa	MOB - Exstew River and watershed	Gitnadoix	0.86	Exchamsiks	0.10	Exstew	0.04	Kitwanga	0.00	Zymogotitz	0.00
185	Kwinitsa	MOB - Upper Squingula River - Motase Lake outlet	Sqingula	0.70	L_Kalum	0.18	Kluayaz_Cr	0.07	Slamgeesh	0.01	Bulkley_sp	0.01
186	Kwinitsa	MOB - Zymoetz River upstream of Clore junction	Zymoetz	0.55	Thomas_Cr	0.18	Morice	0.16	L_Kalum	0.06	Babine	0.04
187	Kwinitsa	MOB - Zymagotitz River and watershed	L_Kalum	0.52	Zymogotitz	0.30	Exchamsiks	0.07	Exstew	0.05	Zymoetz	0.02
188	Kwinitsa	MOB - Babine - downstream of fence	Morice	0.90	Babine	0.05	L_Kalum	0.04	Kuldo	0.00	Bear	0.00
189	Kwinitsa	MOB - Skeena - Salvus to Remo	L_Kalum	1.00	Thomas_Cr	0.00	Kitwanga	0.00	Zymoetz	0.00	Bear	0.00
190	Kwinitsa	MOB - Kitwanga River to fence	Kitwanga	0.59	L_Kalum	0.24	Fiddler_Cr	0.06	Kispiox	0.05	Nangeese_R	0.02
191	Kwinitsa	Salvus	Kispiox	0.37	Babine	0.16	Morice	0.14	Slamgeesh	0.10	Sweetin	0.07
192	Kwinitsa	MOB - Zymoetz River upstream of Clore junction	Suskwa	0.94	Thomas_Cr	0.04	Zymoetz	0.02	Kuldo	0.00	Slamgeesh	0.00
193	Kwinitsa	Bulkley Junction	Morice	0.83	L_Kalum	0.09	Slamgeesh	0.02	Kitwanga	0.02	Nangeese_R	0.01

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Final Radiotelemetry Locations and Genetic Stock Determinations for Skeena Radiotagged Chinook

Fish Number	Tagging Site	Final RadioTelemetry Location	DNA Stock Highest Probability	First Probability	DNA Stock Second Probability	Second Probability	Stock Third Probability	Third Probability	DNA Stock Fourth Probability	Fourth Probability	Stock Fifth Probability	Fifth Probability
194	Kwinitsa	MOB - Bulkley - Suskwa River to Telkwa River	Morice	0.59	L_Kalum	0.34	Squingula	0.05	Zymoetz	0.01	Kispiox	0.00
195	Kwinitsa	MOB - Morice - Thautil River to Morice Lake	Morice	0.87	Zymoetz	0.05	Sweetin	0.03	Kispiox	0.02	Nangeese_R	0.01
196	Kwinitsa	MOB - Bulkley - Suskwa River to Telkwa River	Morice	0.99	Kluayaz_Cr	0.00	Suskwa	0.00	Babine	0.00	Kluatantan	0.00
197	Kwinitsa	Bulkley Junction	Morice	0.99	Slamgeesh	0.00	Squingula	0.00	Kitwanga	0.00	Kispiox	0.00
198	Kwinitsa	Bulkley - Suskwa River to Telkwa River	Morice	0.99	L_Kalum	0.00	Kispiox	0.00	Squingula	0.00	Slamgeesh	0.00
199	Kwinitsa	MOB - Sweetin and Nangeese rivers & watersheds	Kitwanga	0.88	L_Kalum	0.04	Kispiox	0.02	Otsi	0.02	Sweetin	0.01
200	Kwinitsa	MOB - Skeena - Salvus to Remo	Morice	1.00								
201	Kwinitsa	Skeena - Bulkley River to Kispiox River	Slamgeesh	0.50	Kispiox	0.37	L_Kalum	0.04	Gitsegukla	0.02	Bear	0.02
202	Kwinitsa	MOB - Morice - Fixed-station Rx to Thautil River	Morice	1.00	Bear	0.00						
203	Kwinitsa	MOB - Downstream of Scuttsap	Morice	1.00								
204	Kwinitsa	Skeena - Tagging Site to Salvus	Thomas_Cr	0.53	Zymoetz	0.29	Suskwa	0.05	Babine	0.05	Kitwanga	0.04
205	Kwinitsa	MOB - Zymoetz River downstream of Clore junction	Thomas_Cr	1.00	Morice	0.00	Zymoetz	0.00	L_Kalum	0.00	Kitwanga	0.00

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Fish Number	Tagging Site	Final RadioTelemetry Location	DNA Stock Highest Probability	First Probability	DNA Stock Second Probability	Second Probability	Stock Third Probability	Third Probability	DNA Stock Fourth Probability	Fourth Probability	Stock Fifth Probability	Fifth Probability
206	Kwinitisa	MOB - Zymoetz River upstream of Clore junction	Thomas_Cr	0.99	Zymoetz	0.01	Suskwa	0.00	Babine	0.00		
207	Kwinitisa	MOB - Bulkley - Suskwa River to Telkwa River	Morice	0.95	Thomas_Cr	0.03	Babine	0.01	L_Kalum	0.01	Slamgeesh	0.00
208	Kwinitisa	Kitwanga River above fence	Kitwanga	0.82	Kispiox	0.05	Morice	0.04	L_Kalum	0.02	Shequnia	0.01
209	Kwinitisa	Bulkley Junction	Nangeese_R	0.17	Morice	0.17	Otsi	0.14	Squingula	0.12	Kluayaz_Cr	0.12
210	Kwinitisa	MOB - Bulkley - Suskwa River to Telkwa River	Morice	1.00	Zymoetz	0.00	Slamgeesh	0.00	L_Kalum	0.00	Kuldo	0.00
211	Kwinitisa	MOB - Kitwanga River above fence	L_Kalum	0.61	Morice	0.25	Kispiox	0.07	Kitwanga	0.02	Zymoetz	0.02
212	Kwinitisa	MOB - Clore River and watershed	Thomas_Cr	0.99	Zymoetz	0.01	Fiddler_Cr	0.00				
213	Kwinitisa	MOB - Skeena - Scuttsap to Tagging site	Thomas_Cr	0.65	Zymoetz	0.34	Kuldo	0.01	Nangeese_R	0.00	Morice	0.00
214	Kwinitisa	Scuttsap	Morice	0.89	Babine	0.09	Kispiox	0.01	Bear	0.01	Nangeese_R	0.00
215	Kwinitisa	Zymoetz River	Morice	0.99	Kluayaz_Cr	0.00	Kispiox	0.00	L_Kalum	0.00	Nangeese_R	0.00
216	Kwinitisa	MOB - Sustut River upstream of Asitka River	Sustut	1.00								
217	Kwinitisa	MOB - Morice - Thautil River to Morice Lake	Morice	1.00	Babine	0.00	Kluayaz_Cr	0.00	Kispiox	0.00	Slamgeesh	0.00
218	Kwinitisa	Kitseguecla River to Bulkley River	Morice	0.22	Kuldo	0.22	L_Kalum	0.17	Zymoetz	0.11	Slamgeesh	0.11

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219	Kwinitisa	MOB - Zymoetz River downstream of Clore junction	Kitwanga	0.33	Zymoetz	0.31	Thomas_Cr	0.14	L_Kalum	0.08	Fiddler_Cr	0.07
220	Kwinitisa	Scuttsap	Morice	0.96	Kitwanga	0.02	Sweetin	0.01	Slamgeesh	0.00	Nangeese_R	0.00
221	Kwinitisa	Salvus	Thomas_Cr	0.98	Zymoetz	0.02						
222	Kwinitisa	Bulkley Junction	Morice	0.58	Nangeese_R	0.15	Kispiox	0.09	Kluayaz_Cr	0.08	Zymogotitz	0.04
223	Kwinitisa	MOB - Skeena - Zymoetz River to Oliver Creek	Morice	1.00								
224	Kwinitisa	Lakelse River and watershed	Zymogotitz	0.55	Kitwanga	0.36	Suskwa	0.05	L_Kalum	0.01	Kispiox	0.01
225	Kwinitisa	Sustut Fixed Station (merged antennas)	Morice	0.65	Babine	0.19	Kispiox	0.05	Bear	0.05	Nangeese_R	0.02
226	Kwinitisa	Bulkley - Suskwa River to Telkwa River	Morice	1.00	L_Kalum	0.00	Kitwanga	0.00	Kluayaz_Cr	0.00	Slamgeesh	0.00
227	Kwinitisa	Bulkley - Suskwa River to Telkwa River	Morice	0.97	L_Kalum	0.01	Babine	0.01	Slamgeesh	0.01	Zymoetz	0.00
228	Kwinitisa	Bulkley Junction	Suskwa	0.80	Kitwanga	0.16	Gitsegukla	0.02	Kuldo	0.01	Kispiox	0.00
229	Kwinitisa	Bulkley - Suskwa River to Telkwa River	Morice	0.99	Kuldo	0.00	L_Kalum	0.00	Kispiox	0.00	Exstew	0.00
230	Kwinitisa	MOB - Morice - Fixed-station Rx to Thautil River	Morice	1.00	Babine	0.00						
231	Kwinitisa	Kispiox	Sustut	0.99	L_Kalum	0.00	Kluayaz_Cr	0.00	Morice	0.00	Slamgeesh	0.00

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Fish Number	Tagging Site	Final RadioTelemetry Location	DNA Stock Highest Probability	First Probability	DNA Stock Second Probability	Second Probability	Stock Third Probability	Third Probability	DNA Stock Fourth Probability	Fourth Probability	Stock Fifth Probability	Fifth Probability
232	Kwinitsa	MOB - Kispiox River to Sweetin junction	Kispiox	0.43	Kitwanga	0.34	Fiddler_Cr	0.13	Sweetin	0.03	Suskwa	0.03
233	Kwinitsa	Skeena - Oliver Creek to Kitwanga River	Kitwanga	0.56	Morice	0.27	Kispiox	0.09	L_Kalum	0.04	Kuldo	0.02
234	Kwinitsa	Bulkley - Suskwa River to Telkwa River	Morice	1.00	Babine	0.00						
235	Kwinitsa	Zymoetz River	Morice	0.98	L_Kalum	0.01	Kispiox	0.01	Skeena@ Terrace	0.00	Nangees e_R	0.00
236	Kwinitsa	Kalum Mouth	L_Kalum	0.98	Bear	0.01	Babine	0.00	Squingula	0.00	Skeena @Terrac e	0.00
237	Kwinitsa	Bulkley - Suskwa River to Telkwa River	Morice	0.99	Kluayaz_Cr	0.00	Kispiox	0.00	Babine	0.00	Squingul a	0.00
238	Kwinitsa	MOB - Morice - Thautil River to Morice Lake	Morice	0.99	Babine	0.01						
239	Kwinitsa	River above fence	Kitwanga	0.99	Kispiox	0.00	Sweetin	0.00	L_Kalum	0.00	Shequnia	0.00
240	Kwinitsa	MOB - Zymoetz River downstream of Clore junction	Thomas_Cr	1.00	L_Kalum	0.00	Zymoetz	0.00	Kasiks	0.00	Gitnadoix	0.00
241	Kwinitsa	MOB - Exchamsiks River and watershed	Gitnadoix	0.90	Exstew	0.04	L_Kalum	0.02	Zymogotit z	0.01	Kasiks	0.01
242	Kwinitsa	MOB - Kispiox River upstream of Sweetin junction	Kitwanga	0.42	L_Kalum	0.39	Slamgee sh	0.05	Cedar_sp	0.04	Kispiox	0.03

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243	Kwinitsa	MOB - Skeena - Tagging Site to Salvus	L_Kalum	0.84	Slamgeesh	0.06	Squingula	0.03	Kispiox	0.03	Skeena @Terrace	0.02
244	Kwinitsa	Bulkley - Suskwa River to Telkwa River	Morice	0.99	L_Kalum	0.01	Kitwanga	0.00	Squingula	0.00	Babine	0.00
245	Kwinitsa	MOB - Skeena - Oliver Creek to Kitwanga River	Kitwanga	0.35	Sicintine-Sp	0.23	L_Kalum	0.17	Kispiox	0.11	Babine	0.04
246	Kwinitsa	Skeena - Oliver Creek to Kitwanga River	Squingula	0.98	Kuldo	0.01	Sicintine-Sp	0.00	Kluayaz_Cr	0.00	Kispiox	0.00
247	Kwinitsa	Bulkley - Suskwa River to Telkwa River	Squingula	0.52	Morice	0.24	Slamgeesh	0.17	Otsi	0.02	L_Kalum	0.01
248	Kwinitsa	Babine Junction	Kluayaz_Cr	0.78	Squingula	0.10	Kitwanga	0.03	Slamgeesh	0.03	Babine	0.02
249	Kwinitsa	MOB - Zymoetz River downstream of Clore junction	Thomas_Cr	0.70	Zymoetz	0.25	Morice	0.01	Kitwanga	0.01	Slamgeesh	0.01
250	Kwinitsa	MOB - Bulkley - Suskwa River to Telkwa River	Babine	0.46	Morice	0.34	Kitwanga	0.10	L_Kalum	0.04	Cedar_sp	0.03
251	Kwinitsa	MOB - Morice - Fixed-station Rx to Thautil River	Morice	1.00	L_Kalum	0.00	Kispiox	0.00	Gitnadoix	0.00	Kitwanga	0.00
252	Kwinitsa	Kalum Mouth	L_Kalum	0.99	Kitwanga	0.01	Babine	0.01	Squingula	0.00	Skeena @Terrace	0.00
253	Kwinitsa	MOB - Morice - Thautil River to Morice Lake	Morice	1.00	L_Kalum	0.00						
254	Kwinitsa	MOB - Bear River to Lake	Kispiox	0.46	Slamgeesh	0.18	Squingula	0.09	Kitwanga	0.09	Babine	0.04

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255	Kwinitsa	Release - LR	Morice	0.67	L_Kalum	0.27	Skeena @Terrace	0.02	Otsi	0.01	Kluayaz_Cr	0.01
256	Kwinitsa	Remo	Thomas_Cr	0.99	Zymoetz	0.01						
257	Kwinitsa	MOB - Skeena - Scuttsap to Tagging site	Gitnadoix	1.00	Exchamsiks	0.00	Exstew	0.00	L_Kalum	0.00	Sicintine-Sp	0.00
258	Kwinitsa	MOB - Skeena - Scuttsap to Tagging site	Thomas_Cr	1.00	Zymoetz	0.00						
259	Kwinitsa	MOB - Skeena - Salvus to Remo	Morice	0.99	Zymoetz	0.00	Kispiox	0.00	Nangeese_R	0.00	Babine	0.00
260	Kwinitsa	MOB - Morice - Fixed-station Rx to Thautil River	Morice	0.86	L_Kalum	0.05	Kispiox	0.04	Kitwanga	0.02	Nangeese_R	0.01
261	Kwinitsa	MOB - Morice - Thautil River to Morice Lake	Morice	1.00								
262	Kwinitsa	Salvus	Gitnadoix	0.99	Zymogotitz	0.01	Kasiks	0.00	Exstew	0.00	Kitwanga	0.00
263	Kwinitsa	Kispiox River to Sweetin junction	Kitwanga	0.52	Kispiox	0.32	Nangeese_R	0.04	Slamgeesh	0.02	Babine	0.02
264	Kwinitsa	Bulkley - Suskwa River to Telkwa River	Morice	1.00	L_Kalum	0.00	Gitnadoix	0.00	Babine	0.00	Kitwanga	0.00
265	Kwinitsa	Scuttsap	Morice	0.84	Kitwanga	0.16	Kispiox	0.00	Nangeese_R	0.00	L_Kalum	0.00
266	Kwinitsa	MOB - Skeena - Salvus to Remo	Kitwanga	0.64	Zymoetz	0.08	Exstew	0.06	L_Kalum	0.06	Thomas_Cr	0.04
267	Kwinitsa	MOB - Morice - Thautil River to Morice Lake	Morice	0.96	Squingula	0.02	Fiddler_Cr	0.02	Kitwanga	0.00	Babine	0.00
268	Kwinitsa	Bulkley Junction	Morice	1.00	Babine	0.00	Kitwanga	0.00	Bear	0.00	Zymoetz	0.00

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269	Kwinitsa	Kalum Mouth	L_Kalum	0.90	Morice	0.09	Kispiox	0.01	Cedar_sp	0.00	Zymoetz	0.00
270	Kwinitsa	Oliver Creek	Morice	1.00	Sicintine-Sp	0.00	Squingul a	0.00	Slamgees h	0.00	Bear	0.00
271	Kwinitsa	MOB - Skeena - Salvus to Remo	Morice	0.89	Sustut	0.11	Squingul a	0.00	Kluayaz_ Cr	0.00	Babine	0.00
272	Kwinitsa	MOB - Exstew River and watershed	Exstew	0.80	Gitnadoix	0.18	Kispiox	0.01	Zymogotit z	0.00	Slamgee sh	0.00
273	Kwinitsa	Scuttsap	Morice	0.98	Squingula	0.01	Slamgee sh	0.01	L_Kalum	0.00	Kispiox	0.00
274	Kwinitsa	Kalum Mouth	Suskwa	0.41	L_Kalum	0.30	Exstew	0.15	Gitnadoix	0.05	Kitwanga	0.02
275	Kwinitsa	MOB - Kispiox River to Sweetin junction	Slamgeesh	0.53	Kispiox	0.37	Fiddler_ Cr	0.04	Nangeese _R	0.04	Kitwanga	0.01
276	Kwinitsa	MOB - Skeena - Salvus to Remo	L_Kalum	0.85	Morice	0.13	Kitwanga	0.01	Slamgees h	0.01	Gitnadoix	0.00
277	Kwinitsa	Babine River - upstream of fence	Kitwanga	0.72	L_Kalum	0.16	Fiddler_ Cr	0.05	Babine	0.04	Squingul a	0.01
278	Kwinitsa	Kalum Mouth	L_Kalum	0.84	Slamgeesh	0.10	Kitwanga	0.03	Morice	0.02	Kluatanta n	0.00
279	Kwinitsa	MOB - Downstream of Scuttsap	L_Kalum	0.73	Morice	0.18	Zymoetz	0.03	Thomas_ Cr	0.02	Babine	0.01
280	Kwinitsa	MOB - Morice - Fixed-station Rx to Thautil River	Morice	1.00	L_Kalum	0.00						
281	Kwinitsa	MOB - Bulkley - Suskwa River to Telkwa River	Morice	1.00	Kluayaz_Cr	0.00	L_Kalum	0.00	Squingula	0.00	Babine	0.00
282	Kwinitsa	MOB - Skeena - Salvus to Remo	Squingula	0.84	Kluayaz_Cr	0.03	Zymoetz	0.03	Thomas_ Cr	0.02	Bear	0.02
283	Kwinitsa	Scuttsap	Morice	1.00	L_Kalum	0.00	Squingul a	0.00	Kitwanga	0.00	Gitnadoix	0.00

APPENDIX II

Final Radiotelemetry Locations and Genertic Stock Determinations for Skeena Radiotagged Chinook

Fish Number	Tagging Site	Final RadioTelemetry Location	DNA Stock Highest Probability	First Probability	DNA Stock Second Probability	Second Probability	Stock Third Probability	Third Probability	DNA Stock Fourth Probability	Fourth Probability	Stock Fifth Probability	Fifth Probability
284	Kwinitsa	Scuttsap	L_Kalum	0.29	Zymoetz	0.21	Squingul a	0.15	Fiddler_Cr	0.13	Morice	0.06
285	Kwinitsa	Bulkley - Suskwa River to Telkwa River	Morice	0.96	Kluayaz_Cr	0.01	Babine	0.01	Slamgees h	0.01	Kuldo	0.00
286	Kwinitsa	MOB - Skeena - Salvus to Remo	Morice	0.97	Babine	0.02	Kitwanga	0.00	Zymoetz	0.00	L_Kalum	0.00
287	Kwinitsa	MOB - Skeena - Zymoetz River to Oliver Creek	Babine	0.30	Kispiox	0.12	Sicintine- Sp	0.11	Bear	0.10	Squingul a	0.09
288	Kwinitsa	MOB - Morice - Thautil River to Morice Lake	Morice	1.00	Kispiox	0.00	Slamgee sh	0.00	Babine	0.00		
289	Kwinitsa	Morice River	Morice	0.99	Kitwanga	0.01	Babine	0.00	L_Kalum	0.00	Slamgee sh	0.00
290	Kwinitsa	MOB - Bear River to Lake	Kitwanga	0.32	Morice	0.21	Babine	0.15	Zymoetz	0.14	Bear	0.13
291	Kwinitsa	MOB - Zymoetz River downstream of Clore junction	L_Kalum	0.46	Zymoetz	0.24	Gitnadoi x	0.21	Kitwanga	0.03	Exchamsi ks	0.02
292	Kwinitsa	Kalum Mouth	L_Kalum	0.97	Skeena@Te rrace	0.03	Kitwanga	0.00	Babine	0.00	Slamgee sh	0.00
293	Kwinitsa	MOB - Gitnadoix River and watershed	Gitnadoix	0.97	Exstew	0.02	Kasiks	0.01	Exchamsi ks	0.01	Skeena @Terrac e	0.00
294	Kwinitsa	Bulkley - Skeena River to Suskwa River	Kluayaz_Cr	0.70	Otsi	0.24	Morice	0.03	Kitwanga	0.02	Kluakaz_ Cr	0.00
295	Kwinitsa	Scuttsap	Morice	1.00	Babine	0.00	Kluayaz_ Cr	0.00				
296	Kwinitsa	MOB - Skeena - Scuttsap to Tagging site	L_Kalum	0.97	Slamgeesh	0.02	Zymoetz	0.00	Skeena@ Terrace	0.00	Suskwa	0.00

APPENDIX II

Final Radiotelemetry Locations and Genetic Stock Determinations for Skeena Radiotagged Chinook

Fish Number	Tagging Site	Final RadioTelemetry Location	DNA Stock Highest Probability	First Probability	DNA Stock Second Probability	Second Probability	Stock Third Probability	Third Probability	DNA Stock Fourth Probability	Fourth Probability	Stock Fifth Probability	Fifth Probability
297	Kwinitisa	MOB - Bear River to Lake	Slamgeesh	0.40	Babine	0.27	Morice	0.17	Squingula	0.07	Kispiox	0.05
298	Kwinitisa	Kalum Mouth	L_Kalum	0.74	Morice	0.24	Kispiox	0.01	Bear	0.01	Babine	0.00
299	Kwinitisa	Scuttsap	Morice	0.88	Slamgeesh	0.03	Kitwanga	0.02	Kuldo	0.02	Squingula	0.01
300	Kwinitisa	Skeena - Kitsequecla River to Bulkley River	Morice	0.99	L_Kalum	0.00	Kitwanga	0.00	Exstew	0.00	Otsi	0.00
301	Kwinitisa	MOB - Lakelse River and watershed	L_Kalum	0.88	Kitwanga	0.07	Babine	0.04	Zymoetz	0.01	Kuldo	0.01
302	Kwinitisa	MOB - Clore River and watershed	Zymoetz	0.63	Thomas_Cr	0.36	Squingula	0.00	Babine	0.00	Kispiox	0.00
303	Kwinitisa	MOB - Morice - Fixed-station Rx to Thautil River	Morice	0.98	Babine	0.01	L_Kalum	0.01	Squingula	0.00	Kitwanga	0.00
304	Kwinitisa	Scuttsap	Morice	1.00	Squingula	0.00	Babine	0.00	Gitnadoix	0.00	Kitwanga	0.00
305	Kwinitisa	Remo	Morice	1.00	Babine	0.00						
306	Kwinitisa	MOB - Bear River to Lake	Morice	0.62	Kispiox	0.17	Suskwa	0.10	Bear	0.04	Kitwanga	0.03
307	Kwinitisa	MOB - Morice - Thautil River to Morice Lake	Morice	1.00	Bear	0.00	Nangees e_R	0.00	Babine	0.00	L_Kalum	0.00
308	Kwinitisa	Bulkley - Suskwa River to Telkwa River	Morice	1.00	Kluayaz_Cr	0.00	Babine	0.00	Kispiox	0.00		
309	Kwinitisa	Scuttsap	Morice	0.99	Slamgeesh	0.01	Sicintine-Sp	0.00	L_Kalum	0.00	Kispiox	0.00
310	Kwinitisa	Kalum Mouth	L_Kalum	0.38	Morice	0.32	Zymoetz	0.14	Kispiox	0.07	Bear	0.03

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Final Radiotelemetry Locations and Genertic Stock Determinations for Skeena Radiotagged Chinook

Fish Number	Tagging Site	Final RadioTelemetry Location	DNA Stock Highest Probability	First Probability	DNA Stock Second Probability	Second Probability	Stock Third Probability	Third Probability	DNA Stock Fourth Probability	Fourth Probability	Stock Fifth Probability	Fifth Probability
311	Kwinitsa	Zymoetz River	Morice	0.64	Suskwa	0.31	L_Kalum	0.04	Kispiox	0.00	Skeena @Terrace	0.00
312	Kwinitsa	Bulkley Junction	Morice	1.00								
313	Kwinitsa	Zymoetz River	L_Kalum	0.79	Thomas_Cr	0.14	Zymoetz	0.06	Squingula	0.01	Bear	0.00
314	Kwinitsa	Kalum Mouth	L_Kalum	0.84	Nangeese_R	0.05	Kispiox	0.04	Kitwanga	0.03	Babine	0.01
315	Kwinitsa	Kalum Mouth	L_Kalum	0.98	Exstew	0.02	Kitwanga	0.00	Thomas_Cr	0.00	Gitnadoix	0.00
316	Kwinitsa	MOB - Morice - Fixed-station Rx to Thautil River	Morice	1.00	L_Kalum	0.00						
317	Kwinitsa	MOB - Skeena - Scuttsap to Tagging site	L_Kalum	0.85	Kitwanga	0.12	Suskwa	0.01	Kispiox	0.01	Babine	0.01
318	Kwinitsa	Oliver Creek	Kispiox	0.34	L_Kalum	0.20	Zymoetz	0.12	Kitwanga	0.11	Squingula	0.08
319	Kwinitsa	Bulkley - Suskwa River to Telkwa River	Morice	1.00	Zymoetz	0.00	Kispiox	0.00				
320	Kwinitsa	MOB - Bulkley - Suskwa River to Telkwa River	Morice	1.00	L_Kalum	0.00	Kitwanga	0.00	Slamgeesh	0.00	Kuldo	0.00
321	Kwinitsa	Scuttsap	L_Kalum	0.96	Kispiox	0.03	Skeena @Terrace	0.00	Kitwanga	0.00	Slamgeesh	0.00
322	Kwinitsa	MOB - Skeena - Zymoetz River to Oliver Creek	Morice	0.94	Nangeese_R	0.02	Zymoetz	0.01	Kitwanga	0.01	Kuldo	0.01
323	Kwinitsa	Scuttsap	L_Kalum	0.23	Slamgeesh	0.20	Babine	0.20	Squingula	0.15	Kitwanga	0.10
324	Kwinitsa	Kalum Mouth	L_Kalum	0.93	Kispiox	0.03	Zymoetz	0.01	Babine	0.01	Bear	0.01

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Final Radiotelemetry Locations and Genertic Stock Determinations for Skeena Radiotagged Chinook

Fish Number	Tagging Site	Final RadioTelemetry Location	DNA Stock Highest Probability	First Probability	DNA Stock Second Probability	Second Probability	Stock Third Probability	Third Probability	DNA Stock Fourth Probability	Fourth Probability	Stock Fifth Probability	Fifth Probability
325	Kwinitsa	MOB - Skeena - Salvus to Remo	L_Kalum	0.97	Kitwanga	0.02	Kluatantan	0.00	Slamgeesh	0.00	Kuldo	0.00
326	Kwinitsa	Kalum Mouth	L_Kalum	0.98	Kitwanga	0.01	Kluayaz_Cr	0.01	Bear	0.00	Slamgeesh	0.00
327	Kwinitsa	Kalum Mouth	Fiddler_Cr	0.55	L_Kalum	0.34	Zymoetz	0.08	Kitwanga	0.01	Kispiox	0.01
328	Kwinitsa	Release - LR	L_Kalum	0.98	Kispiox	0.01	Kitwanga	0.00	Morice	0.00	Fiddler_Cr	0.00
329	Kwinitsa	MOB - Skeena - Tagging Site to Salvus	L_Kalum	0.89	Morice	0.07	Kispiox	0.02	Bear	0.01	Babine	0.00
330	Kwinitsa	MOB - Lakelse River and watershed	Suskwa	0.38	L_Kalum	0.15	Kitwanga	0.10	Sicintine-Sp	0.09	Zymoetz	0.08
331	Kwinitsa	MOB - Skeena - Oliver Creek to Kitwanga River	Morice	0.93	Kispiox	0.05	L_Kalum	0.01	Zymoetz	0.00	Kitwanga	0.00
332	Kwinitsa	Downstream of Scuttsap	Morice	1.00	Skeena@Terrace	0.00						
333	Kwinitsa	Scuttsap	L_Kalum	0.98	Bear	0.01	Kuldo	0.00	Slamgeesh	0.00	Kitwanga	0.00
334	Kwinitsa	MOB - Skeena - Oliver Creek to Kitwanga River	L_Kalum	0.88	Gitnadoix	0.06	Morice	0.02	Slamgeesh	0.01	Exstew	0.01
335	Kwinitsa	MOB - Bulkley - Suskwa River to Telkwa River	Morice	0.59	Kuldo	0.22	Zymoetz	0.13	Thomas_Cr	0.04	Kluayaz_Cr	0.01
336	Kwinitsa	MOB - Morice - Thautil River to Morice Lake	Morice	0.99	Kispiox	0.01	Squingula	0.00	Slamgeesh	0.00	Babine	0.00
337	Kwinitsa	MOB - Skeena - Salvus to Remo	L_Kalum	0.69	Zymoetz	0.14	Morice	0.08	Thomas_Cr	0.03	Squingula	0.03
338	Kwinitsa	Scuttsap	Morice	1.00	Kispiox	0.00	L_Kalum	0.00	Babine	0.00		

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Final Radiotelemetry Locations and Genetic Stock Determinations for Skeena Radiotagged Chinook

Fish Number	Tagging Site	Final RadioTelemetry Location	DNA Stock Highest Probability	First Probability	DNA Stock Second Probability	Second Probability	Stock Third Probability	Third Probability	DNA Stock Fourth Probability	Fourth Probability	Stock Fifth Probability	Fifth Probability
339	Kwinitsa	MOB - Skeena - Tagging Site to Salvus	L_Kalum	0.39	Kitwanga	0.38	Nangees e_R	0.09	Squingula	0.07	Sicintine-Sp	0.04
340	Kwinitsa	MOB - Bear River to Lake	Morice	0.52	Otsi	0.40	Kluayaz_Cr	0.03	Slamgeesh	0.02	Babine	0.02
341	Kwinitsa	Scuttsap	Exstew	0.30	Kuldo	0.28	L_Kalum	0.27	Kitwanga	0.10	Gitnadoix	0.01
342	Kwinitsa	MOB - Bear River to Lake	Slamgeesh	0.48	Kitwanga	0.17	Morice	0.07	Sustut	0.05	Babine	0.04
343	Kwinitsa	MOB - Babine River - upstream of fence	Fiddler_Cr	0.28	Squingula	0.16	Thomas_Cr	0.13	Morice	0.10	Sicintine-Sp	0.07
344	Kwinitsa	Kalum Mouth	L_Kalum	0.96	Bear	0.03	Babine	0.00	Zymoetz	0.00	Thomas_Cr	0.00
345	Kwinitsa	Babine River - upstream of fence	Squingula	0.21	Otsi	0.17	Kluayaz_Cr	0.13	Sustut	0.13	L_Kalum	0.09
346	Kwinitsa	MOB - Morice - Thautil River to Morice Lake	Morice	1.00	Kispiox	0.00	Slamgeesh	0.00	L_Kalum	0.00	Zymoetz	0.00
347	Kwinitsa	Bulkley Junction	Morice	0.99	Babine	0.00	L_Kalum	0.00	Slamgeesh	0.00	Kitwanga	0.00
348	Kwinitsa	MOB - Bulkley - Suskwa River to Telkwa River	Morice	0.99	Babine	0.01	Kispiox	0.00	L_Kalum	0.00	Squingula	0.00
349	Kwinitsa	MOB - Lakelse River and watershed	L_Kalum	0.96	Skeena@Terrace	0.01	Nangees e_R	0.01	Zymoetz	0.01	Kitwanga	0.00
350	Kwinitsa	Salvus	Zymoetz	0.54	L_Kalum	0.15	Kitwanga	0.13	Slamgeesh	0.06	Thomas_Cr	0.05
351	Kwinitsa	MOB - Morice - Fixed-station Rx to Thautil River	Squingula	0.62	Morice	0.15	Kluayaz_Cr	0.07	Kluatanta n	0.06	Babine	0.04
352	Kwinitsa	MOB - Babine - downstream of fence	Slamgeesh	0.76	Kispiox	0.07	Sicintine-Sp	0.04	Squingula	0.04	Babine	0.02

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Final Radiotelemetry Locations and Genetic Stock Determinations for Skeena Radiotagged Chinook

Fish Number	Tagging Site	Final RadioTelemetry Location	DNA Stock Highest Probability	First Probability	DNA Stock Second Probability	Second Probability	Stock Third Probability	Third Probability	DNA Stock Fourth Probability	Fourth Probability	Stock Fifth Probability	Fifth Probability
501	Kuldo	MOB - Mosque River and watershed	Squingula	0.46	Bear	0.45	Babine	0.07	Otsi	0.01	Kluayaz_Cr	0.01
502	Kuldo	MOB - Sicintine River and watershed	Babine	0.68	Squingula	0.23	Kluayaz_Cr	0.06	Sicintine-Sp	0.01	Morice	0.01
503	Kuldo	MOB - Sustut River upstream of Asitka River	Sustut	1.00	Squingula	0.00	Kluayaz_Cr	0.00				
504	Kuldo	Kluatantan Creek - upstream of Tantan Creek and Kluayaz Creek	Kluayaz_Cr	0.66	Squingula	0.30	Otsi	0.03	Babine	0.01	Kitwanga	0.00
505	Kuldo	MOB - Skeena - Kluatantan River to headwaters	Otsi	0.80	Bear	0.11	Kluayaz_Cr	0.05	Babine	0.04	Kuldo	0.00
506	Kuldo	MOB - Babine - downstream of fence	Babine	0.69	Bear	0.22	Slamgeesh	0.03	Kluakaz_Cr	0.01	Kuldo	0.01
507	Kuldo	Squingula Junction	Squingula	0.98	Kluakaz_Cr	0.01	Kluayaz_Cr	0.01	Sustut	0.01	Sicintine-Sp	0.00
508	Kuldo	MOB - Sustut River upstream of Asitka River	Squingula	0.62	Kluayaz_Cr	0.27	Sicintine-Sp	0.10	Otsi	0.00	Sweetin	0.00
509	Kuldo	Sustut Fixed Station (merged antennas)	Sustut	1.00	Bear	0.00	Squingula	0.00	Kluayaz_Cr	0.00		
510	Kuldo	MOB - Skeena - Kluatantan River to headwaters	Squingula	0.91	Slamgeesh	0.04	Bear	0.02	Babine	0.02	Kluayaz_Cr	0.01
511	Kuldo	MOB - Lower Squingula River	Bear	0.61	Babine	0.20	Squingula	0.11	Slamgeesh	0.03	Sweetin	0.03

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Final Radiotelemetry Locations and Genetic Stock Determinations for Skeena Radiotagged Chinook

Fish Number	Tagging Site	Final RadioTelemetry Location	DNA Stock Highest Probability	First Probability	DNA Stock Second Probability	Second Probability	Stock Third Probability	Third Probability	DNA Stock Fourth Probability	Fourth Probability	Stock Fifth Probability	Fifth Probability
512	Kuldo	MOB - Sustut River upstream of Asitka River	Sustut	1.00								
513	Kuldo	Sustut Fixed Station (merged antennas)	Babine	0.21	Sicintine-Sp	0.20	Bear	0.20	Squingula	0.18	Kluayaz_Cr	0.08
514	Kuldo	MOB - Sicintine River and watershed	Otsi	0.43	Sicintine-Sp	0.36	Squingula	0.10	Kluayaz_Cr	0.04	Bear	0.03
515	Kuldo	MOB - Sustut River upstream of Asitka River	Sustut	1.00	Squingula	0.00						
516	Kuldo	MOB - Bear River to Lake	Babine	0.81	Bear	0.15	Otsi	0.03	Squingula	0.01	Kluakaz_Cr	0.00
517	Kuldo	MOB - Mosque River and watershed	Bear	0.30	Otsi	0.25	Squingula	0.23	Sustut	0.12	Babine	0.06
518	Kuldo	MOB - Slamegeesh River and watershed	Bear	0.62	Sicintine-Sp	0.13	Otsi	0.08	Babine	0.05	Kuldo	0.04
519	Kuldo	MOB - Sicintine River and watershed	Sicintine-Sp	0.54	Squingula	0.30	Sweetin	0.05	Bear	0.04	Otsi	0.03
520	Kuldo	MOB - Lower Squingula River	Squingula	0.69	Babine	0.13	Otsi	0.10	Kitwanga	0.05	Kluakaz_Cr	0.01
521	Kuldo	MOB - Sustut River upstream of Asitka River	Sustut	0.91	Babine	0.06	Squingula	0.02	Kluayaz_Cr	0.01	Otsi	0.00
522	Kuldo	MOB - Sustut River upstream of Asitka River	Sustut	1.00	Bear	0.00	Otsi	0.00	Kluakaz_Cr	0.00		
523	Kuldo	MOB - Sustut River upstream of Asitka River	Sustut	1.00								

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Final Radiotelemetry Locations and Genertic Stock Determinations for Skeena Radiotagged Chinook

Fish Number	Tagging Site	Final RadioTelemetry Location	DNA Stock Highest Probability	First Probability	DNA Stock Second Probability	Second Probability	Stock Third Probability	Third Probability	DNA Stock Fourth Probability	Fourth Probability	Stock Fifth Probability	Fifth Probability
524	Kuldo	MOB - Slamgeesh River and watershed	Otsi	0.60	Squingula	0.23	Slamgeesh	0.05	Bear	0.05	Kluayaz_Cr	0.04
525	Kuldo	Sicintine Junction	Sustut	1.00								
526	Kuldo	MOB - Skeena - Sustut River to Kluatantan River	Squingula	0.71	Bear	0.16	Babine	0.07	Otsi	0.02	Kluayaz_Cr	0.02
527	Kuldo	MOB - Upper Squingula River - Motase Lake outlet	Squingula	0.95	Bear	0.02	Otsi	0.02	Sustut	0.01	Babine	0.00
528	Kuldo	MOB - Mosque River and watershed	Squingula	0.87	Bear	0.09	Otsi	0.04	Kluayaz_Cr	0.00	Babine	0.00
529	Kuldo	MOB - Bear River to Lake	Bear	0.82	Babine	0.13	Squingula	0.02	Morice	0.01	Sustut	0.01
530	Kuldo	MOB - Skeena - Sustut River to Kluatantan River	Otsi	0.40	Squingula	0.18	Kluayaz_Cr	0.14	Babine	0.13	Bear	0.06
531	Kuldo	MOB - Lower Squingula River	Squingula	1.00	Kluayaz_Cr	0.00	Skeena @Terrace	0.00	Kuldo	0.00	Bear	0.00
532	Kuldo	MOB - Bear River to Lake	Babine	0.51	Bear	0.29	Sweetin	0.10	Kluayaz_Cr	0.06	Squingula	0.01
533	Kuldo	Squingula Junction	Squingula	0.99	Otsi	0.00	Kluayaz_Cr	0.00	Sustut	0.00	Kluakaz_Cr	0.00
534	Kuldo	MOB - Kuldo Creek and watershed	Babine	0.45	Bear	0.21	Squingula	0.19	Kluayaz_Cr	0.11	Slamgeesh	0.03
535	Kuldo	MOB - Lower Squingula River	Bear	0.39	Otsi	0.24	Squingula	0.22	Babine	0.06	Nangeese_R	0.05
536	Kuldo	MOB - Sicintine River and watershed	Squingula	0.78	Bear	0.15	Babine	0.06	Otsi	0.01	Kluayaz_Cr	0.00

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Fish Number	Tagging Site	Final RadioTelemetry Location	DNA Stock Highest Probability	First Probability	DNA Stock Second Probability	Second Probability	Stock Third Probability	Third Probability	DNA Stock Fourth Probability	Fourth Probability	Stock Fifth Probability	Fifth Probability
537	Kuldo	MOB - Lower Squingula River	Sqingula	0.88	Bear	0.06	Otsi	0.03	Kluayaz_Cr	0.01	Sicintine-Sp	0.01
538	Kuldo	MOB - Sustut River upstream of Asitka River	Sustut	0.89	Bear	0.04	Otsi	0.03	Kluakaz_Cr	0.02	Kluayaz_Cr	0.01
539	Kuldo	Release - Kuldo	Sqingula	0.42	Babine	0.22	Sweetin	0.14	Otsi	0.08	Kitwanga	0.05
540	Kuldo	Sicintine Junction	Sustut	1.00								
541	Kuldo	MOB - Lower Squingula River	Sqingula	0.75	Otsi	0.19	Kluayaz_Cr	0.02	Bear	0.02	Kluakaz_Cr	0.01
542	Kuldo	MOB - Skeena - Sustut River to Kluatantan River	Sqingula	0.96	Kluayaz_Cr	0.04	Bear	0.00	Babine	0.00	Otsi	0.00
543	Kuldo	MOB - Sustut River upstream of Asitka River	Otsi	0.78	Sustut	0.16	Kluakaz_Cr	0.04	Bear	0.02	Babine	0.00
544	Kuldo	MOB - Skeena - Kluatantan River to headwaters	Otsi	0.98	Babine	0.01	Sqingula	0.00	Bear	0.00	Kluayaz_Cr	0.00
545	Kuldo	Sustut River upstream of Asitka River	Sustut	1.00								
546	Kuldo	Kluatantan Creek - upstream of Tantan Creek and Kluayaz Creek	Bear	0.85	Otsi	0.10	Babine	0.03	Sqingula	0.01	Sweetin	0.01
547	Kuldo	MOB - Skeena - Kluatantan River to headwaters	Kluayaz_Cr	0.84	Otsi	0.14	Kluakaz_Cr	0.01	Sqingula	0.01	Sicintine-Sp	0.00
548	Kuldo	MOB - Slamgeesh River and watershed	Bear	0.91	Slamgeesh	0.05	Sweetin	0.04	Otsi	0.00	Kluayaz_Cr	0.00

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Final Radiotelemetry Locations and Genetic Stock Determinations for Skeena Radiotagged Chinook

Fish Number	Tagging Site	Final RadioTelemetry Location	DNA Stock Highest Probability	First Probability	DNA Stock Second Probability	Second Probability	Stock Third Probability	Third Probability	DNA Stock Fourth Probability	Fourth Probability	Stock Fifth Probability	Fifth Probability
549	Kuldo	MOB - Skeena - Kluatantan River to headwaters	Squingula	0.34	Babine	0.21	Kluayaz_Cr	0.20	Bear	0.15	Sweetin	0.06
550	Kuldo	MOB - Sustut River upstream of Asitka River	Sustut	0.99	Bear	0.00	Squingula	0.00	Otsi	0.00	Kluayaz_Cr	0.00
551	Kuldo	MOB - Bear River to Lake	Otsi	0.75	Bear	0.20	Squingula	0.05	Babine	0.00	Sicintine-Sp	0.00
552	Kuldo	MOB - Skeena - Kluatantan River to headwaters	Squingula	0.83	Bear	0.09	Kluayaz_Cr	0.03	Otsi	0.02	Babine	0.02
553	Kuldo	MOB - Sustut River upstream of Asitka River	Sustut	0.85	Otsi	0.13	Kluakaz_Cr	0.01	Kluayaz_Cr	0.00	Bear	0.00
554	Kuldo	MOB - Kuldo Creek and watershed	Bear	0.74	Babine	0.18	L_Kalum	0.03	Sicintine-Sp	0.03	Squingula	0.01
555	Kuldo	MOB - Sustut River upstream of Asitka River	Squingula	0.51	Sustut	0.46	Kluayaz_Cr	0.01	Bear	0.01	Babine	0.01
556	Kuldo	MOB - Bear River to Lake	Otsi	0.46	Bear	0.18	Kluayaz_Cr	0.13	Babine	0.13	Squingula	0.06
557	Kuldo	MOB - Slamegeesh River and watershed	Bear	0.78	Babine	0.19	Sweetin	0.01	Squingula	0.01	Kluayaz_Cr	0.00
558	Kuldo	MOB - Lower Squingula River	Squingula	0.91	Otsi	0.03	Kitwanga	0.03	Babine	0.01	Sicintine-Sp	0.01
559	Kuldo	MOB - Skeena - Kuldo Creek to Sicintine River	Otsi	0.39	Bear	0.24	Sicintine-Sp	0.15	Squingula	0.11	Babine	0.08

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560	Kuldo	MOB - Kluatantan Creek - upstream of Tantan Creek and Kluayaz Creek	Kluayaz_Cr	0.36	Bear	0.32	Otsi	0.26	Babine	0.04	Kluakaz_Cr	0.01
561	Kuldo	MOB - Kuldo Creek and watershed	Babine	0.46	Bear	0.44	Otsi	0.03	Kitwanga	0.03	Squingula	0.01
562	Kuldo	MOB - Bear River to Lake	Otsi	0.77	Bear	0.12	Kluakaz_Cr	0.04	Babine	0.03	Kluayaz_Cr	0.02
563	Kuldo	MOB - Sustut River upstream of Asitka River	Otsi	0.26	Bear	0.20	Babine	0.17	Sweetin	0.14	Sustut	0.14
564	Kuldo	MOB - Lower Squingula River	Otsi	0.49	Bear	0.24	Squingula	0.16	Sicintine-Sp	0.04	Kluayaz_Cr	0.03
565	Kuldo	MOB - Skeena - Kluatantan River to headwaters	Squingula	0.75	Kluayaz_Cr	0.22	Kluakaz_Cr	0.03	Bear	0.01	Slamgeesh	0.00
566	Kuldo	MOB - Slamgeesh River and watershed	Bear	0.59	Otsi	0.22	Kluayaz_Cr	0.10	Squingula	0.02	Babine	0.02
567	Kuldo	MOB - Lower Squingula River	Squingula	0.96	Bear	0.02	Otsi	0.01	Kluayaz_Cr	0.00	Babine	0.00
568	Kuldo	MOB - Skeena - Sicintine River to Slamgeesh River	Babine	0.89	Slamgeesh	0.04	Squingula	0.03	Kluayaz_Cr	0.03	Otsi	0.00
569	Kuldo	MOB - Lower Squingula River	Squingula	0.47	Otsi	0.39	Kluayaz_Cr	0.06	Sustut	0.03	Kluakaz_Cr	0.03
570	Kuldo	MOB - Sicintine River and watershed	Bear	0.70	Squingula	0.16	Otsi	0.08	Babine	0.05	Sicintine-Sp	0.01
571	Kuldo	MOB - Slamgeesh River and watershed	Kluayaz_Cr	0.51	Bear	0.21	Babine	0.11	Squingula	0.07	Otsi	0.06

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572	Kuldo	Sicintine Junction	Bear	0.72	Kitwanga	0.07	Otsi	0.07	Babine	0.05	Sweetin	0.02
573	Kuldo	Sustut River upstream of Asitka River	Sustut	1.00	Babine	0.00	Squingula	0.00				
574	Kuldo	MOB - Bear River to Lake	Bear	0.60	Babine	0.20	Squingula	0.14	Kluayaz_Cr	0.04	Otsi	0.02
576	Kuldo	MOB - Skeena - Kluatantan River to headwaters	Bear	0.55	Squingula	0.15	Sweetin	0.08	Babine	0.06	Kluayaz_Cr	0.05
577	Kuldo	MOB - Skeena - Kuldo Creek to Sicintine River	Kluayaz_Cr	0.81	Squingula	0.15	Otsi	0.03	Bear	0.00	Kluatantan	0.00
578	Kuldo	MOB - Bear River to Lake	Bear	0.94	Slamgeesh	0.04	Babine	0.01	Kispiox	0.01	Squingula	0.00
580	Kuldo	MOB - Slamgeesh River and watershed	Otsi	0.51	Bear	0.23	Slamgeesh	0.09	Sicintine-Sp	0.08	Squingula	0.05
581	Kuldo	MOB - Bear River to Lake	Bear	0.93	Babine	0.06	Slamgeesh	0.01	Otsi	0.00	Kitwanga	0.00
582	Kuldo	MOB - Bear River to Lake	Bear	0.66	Babine	0.24	Squingula	0.06	Sweetin	0.03	Otsi	0.01
583	Kuldo	MOB - Slamgeesh River and watershed	Babine	0.54	Otsi	0.17	Bear	0.14	Squingula	0.05	Slamgeesh	0.05
584	Kuldo	MOB - Bear River to Lake	Bear	0.86	Squingula	0.07	Sweetin	0.02	Otsi	0.01	Babine	0.01
585	Kuldo	Sicintine Junction	Bear	0.85	Otsi	0.07	Babine	0.07	Squingula	0.01	Kluayaz_Cr	0.00
586	Kuldo	MOB - Bear River to Lake	Bear	0.86	Babine	0.07	Squingula	0.05	Otsi	0.00	Morice	0.00
588	Kuldo	Sustut - Skeena River to Bear River	Bear	0.62	Otsi	0.22	Squingula	0.12	Babine	0.03	Kluayaz_Cr	0.01

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589	Kuldo	MOB - Kispiox River to Sweetin junction	Babine	0.79	Slamgeesh	0.07	Kitwanga	0.06	Otsi	0.02	Shequnia	0.02
590	Kuldo	MOB - Bear River to Lake	Babine	0.87	Bear	0.08	Squingula	0.02	Kluayaz_Cr	0.02	Khyex_R	0.00
591	Kuldo	MOB - Sustut - Skeena River to Bear River	Sustut	1.00	Squingula	0.00						
592	Kuldo	MOB - Bear River to Lake	Babine	0.79	Otsi	0.08	Bear	0.05	Squingula	0.03	Slamgeesh	0.02
593	Kuldo	MOB - Lower Squingula River	Otsi	0.45	Babine	0.32	Squingula	0.14	Bear	0.06	Sicintine-Sp	0.01
594	Kuldo	MOB - Bear River to Lake	Bear	0.87	Otsi	0.06	Sweetin	0.03	Kuldo	0.03	Kluayaz_Cr	0.01
595	Kuldo	MOB - Bear River to Lake	Bear	0.76	Kluayaz_Cr	0.18	Squingula	0.04	Babine	0.01	Otsi	0.01
596	Kuldo	MOB - Bear River to Lake	Bear	0.96	Babine	0.03	Morice	0.00	Kitwanga	0.00	Kispiox	0.00
597	Kuldo	MOB - Bear River to Lake	Bear	0.72	Babine	0.09	Kitwanga	0.08	Slamgeesh	0.04	Squingula	0.03
598	Kuldo	MOB - Bear River to Lake	Squingula	0.33	Kluayaz_Cr	0.23	Babine	0.21	Bear	0.16	Slamgeesh	0.05
599	Kuldo	MOB - Bear River to Lake	Babine	0.91	Squingula	0.04	Bear	0.03	Morice	0.01	Kluayaz_Cr	0.00
600	Kuldo	MOB - Bear River to Lake	Bear	0.90	Otsi	0.05	Kluayaz_Cr	0.02	Squingula	0.01	Sustut	0.01
601	Kuldo	MOB - Bear River to Lake	Bear	0.79	Babine	0.15	Otsi	0.03	Squingula	0.02	Kluakaz_Cr	0.00
605	Kuldo	MOB - Sustut - Skeena River to Bear River	Bear	0.91	Babine	0.04	Kluayaz_Cr	0.04	Kispiox	0.00	Squingula	0.00
606	Kuldo	MOB - Bear River to Lake	Babine	0.71	Bear	0.29	Zymogotitz	0.00	Otsi	0.00		
607	Kuldo	Bulkley Junction	Kluayaz_Cr	0.69	Squingula	0.18	Babine	0.04	Bear	0.04	Otsi	0.02

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608	Kuldo	Release - Kuldo	Babine	0.96	Squingula	0.02	Bear	0.01	Otsi	0.00	Slamgeesh	0.00
610	Kuldo	MOB - Bear River to Lake	Bear	0.76	Babine	0.15	Kluayaz_Cr	0.04	Otsi	0.02	Squingula	0.02
611	Kuldo	MOB - Bear River to Lake	Otsi	0.80	Bear	0.17	Kluayaz_Cr	0.01	Babine	0.01	Kispiox	0.00
612	Kuldo	MOB - Bear River to Lake	Babine	0.62	Kluayaz_Cr	0.27	Squingula	0.05	Bear	0.04	Otsi	0.03
613	Kuldo	MOB - Bear River to Lake	Babine	0.75	Bear	0.23	Kluayaz_Cr	0.01	Zymoetz	0.00	Slamgeesh	0.00
614	Kuldo	MOB - Skeena - Sicintine River to Slamgeesh River	Otsi	0.48	Squingula	0.45	Sweetin	0.03	Kluayaz_Cr	0.01	Sicintine-Sp	0.01
615	Kuldo	MOB - Skeena - Sustut River to Kluatantan River	Bear	0.82	Babine	0.10	Squingula	0.05	Slamgeesh	0.01	Otsi	0.01
616	Kuldo	MOB - Sustut - Skeena River to Bear River	Squingula	0.56	Bear	0.40	Babine	0.01	Kluakaz_Cr	0.01	Fiddler_Cr	0.00
617	Kuldo	MOB - Bear River to Lake	Babine	0.60	Bear	0.22	Otsi	0.15	Morice	0.01	Kluayaz_Cr	0.01
618	Kuldo	MOB - Skeena - Kalum River to Zymoetz River	Otsi	0.57	Squingula	0.22	Babine	0.09	Kluayaz_Cr	0.04	Bear	0.04
619	Kuldo	MOB - Bear River to Lake	Squingula	0.53	Otsi	0.31	Bear	0.10	Babine	0.05	Kluayaz_Cr	0.01
620	Kuldo	MOB - Bear River to Lake	Bear	0.79	Otsi	0.08	Sicintine-Sp	0.08	Sweetin	0.02	Squingula	0.01
621	Kuldo	MOB - Slamgeesh River and watershed	Sustut	0.96	Kluayaz_Cr	0.02	Squingula	0.02	Slamgeesh	0.00	Kuldo	0.00