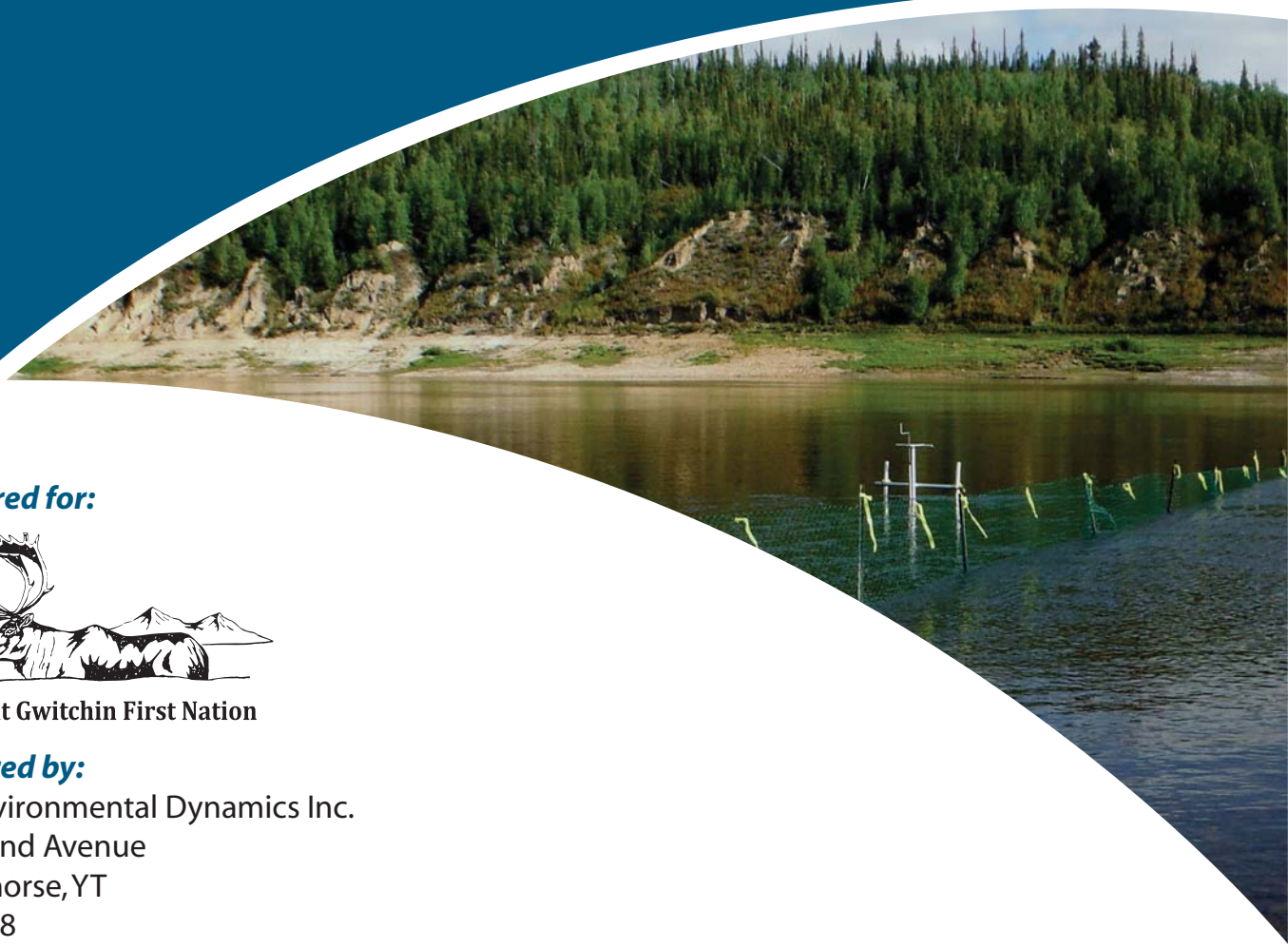
2013 Porcupine River Chum Sonar Report



Prepared for:

Vuntut Gwitchin First Nation

Prepared by:

EDI Environmental Dynamics Inc.
2195-2nd Avenue
Whitehorse, YT
Y1A 3T8

EDI Contact:

Ben Snow
867.393.4882

EDI Project No:

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EDI
ENVIRONMENTAL DYNAMICS INC.

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EXECUTIVE SUMMARY

In 2013, stock assessment of chum salmon on the Porcupine River was transitioned from the Fishing Branch River enumeration weir to Porcupine River sonar site, located approximately 2 km downstream of Old Crow. Multi-beam sonar (ARIS and DIDSON sonars) was used to enumerate chum salmon passing the sonar site from August 24 to October 12, 2013 In conjunction with sonar counts, drift netting was conducted downstream of the sonar site to apportion the sonar counts between chum salmon and other adult, resident fish species present at the site. The field component of this project was conducted primarily by Vuntut Gwitch'in First Nation (VGFN) technicians, who received employment and training related to the operation of multi-beam sonar, hydro-acoustic data analysis and drift netting.

A total of 33,042 fish targets were counted during the operational period of the sonar project; 98% (51 of 52) of fish captured in the drift netting fishery were chum salmon. Test netting data from 2013, supported by 2011 and 2012 drift netting data, and historical gill netting data (2003 to 2010) from previous chum salmon stock assessment programs (Mark-Recapture and CPUE indices), show that the numbers of adult fish other than chum salmon are negligible in comparison to migrating chum salmon. The total interpolated upstream passage estimate of chum salmon for the operational period of Porcupine River sonar site in 2013 was 35,626.

The 2013 sonar counts suggest a bi-modal distribution of migrating chum salmon, with a peak daily passage rate on September 17; a similar pattern of counts was observed during the 2012 run. As in 2011 and 2012, sonar data from 2013 show that nearly all detected chum salmon migrated within 20 m of the sonar transducer on both river banks, indicating a bank oriented distribution. This behavioral pattern facilitates the enumeration of these fish with multi-beam sonar. Bathymetric data collection and mapping conducted in 2013 show that the bottom profile at the Porcupine River sonar site appears to be similar to the profile that was mapped in 2010 (EDI 2011).

ACKNOWLEDGEMENTS

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AUTHORSHIP

This report was prepared by the EDI Environmental Dynamics Inc. EDI staff who contributed to this project include:

Charles Blysak, Dipl. Tech ..... Primary Author/Field Program Leader

Ben Snow, B.Sc., R.P.Bio ..... Primary Editor/Project Biologist

Pat Tobler, B.Sc., R.P.Bio ..... Senior Review

Joel MacFabe ..... Field Technician

Lucas Wheeler ..... Field Technician

Laura Grieve, B.Sc. ..... GIS

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1 INTRODUCTION

1.1 BACKGROUND AND CONTEXT

Salmon migrating up the Porcupine River through the Traditional Territory of the Vuntut Gwitchin First Nation (VGFN) are culturally important to VGFN citizens. Old Crow, the only Canadian community on the Porcupine River, relies on the salmon fishery as a source of traditional food. The subsistence harvest of salmon on the Porcupine River is an important component of local people's diets.

Three salmon species spawn in the Canadian portion of the Porcupine River: Chinook (*Oncorhynchus tshawytscha)*, chum (*Oncorhynchus keta)* and coho (*Oncorhynchus kisutch).* Chinook and chum salmon are managed jointly through the Yukon River Panel's Joint Technical Committee (JTC) process; there is currently no joint management process for coho salmon. The Yukon River Panel was established to manage "transboundary" salmon stocks (which move through waters subject to both U.S. and Canadian fisheries management processes) in a cooperative forum.

This project focused on the chum salmon run, which passes Old Crow in late summer. A former DFO enumeration weir on the Fishing Branch River (a tributary to the Porcupine River) historically recorded annual passage rates between approximately 5,057 and 186,000 fall chum, with an average annual return of approximately 44,000 (during the period of 1998 to 2011; JTC 2012). Genetic sampling of fall chum salmon at the Pilot Station sonar (in Alaska) provides broad scale information on the chum run in the entire Yukon River; since 1995 fall chum salmon counted at the Fishing Branch River weir have accounted for 4% of the total Yukon River fall chum salmon run (JTC 2012)

The Vuntut Gwitch'in Government (VGG) is committed to improving in-season enumeration and management capacity for fall chum salmon in the Porcupine River. In order to provide an accurate and timely in-season estimate of adult fall chum salmon passage at Old Crow, VGG has pursued the development of a sonar enumeration program. A reconnaissance survey located a suitable sonar deployment site in 2009 (Snow 2010) and a successful week-long pilot program was conducted in 2010 (Snow 2010). In 2011 and 2012, seasonal sonar enumeration of chum salmon was conducted at site 2 km downstream of Old Crow.

In 2013, VGG received funding from the Yukon River Panel's Restoration and Enhancement Fund to complete a comprehensive sonar enumeration program for the fall chum salmon run. The field portion of this program was planned for up to 8 weeks, and was conducted from late August to mid-October. The goals of this program were to:

- Enumerate passing fall chum salmon;
- Conduct test netting (using drift nets) to apportion the sonar counts;
- Develop local capacity to conduct fisheries work within the community of Old Crow.

1.2 STUDY AREA

The Porcupine River is one of the largest tributaries in the Yukon River watershed (Figure 1). It extends from Fort Yukon, Alaska, across the Canada/U.S. border where it drains a large portion of the northern Yukon, much of which is located within the VGFN's Traditional Territory. The Porcupine River has a number of large tributaries within Canada, including the Whitestone, Miner, and Fishing Branch rivers. The only significant Canadian settlement within the Porcupine River watershed is the village of Old Crow, located approximately 80 kilometres east of the Canada/U.S. border at the confluence of the Old Crow and Porcupine rivers. Old Crow has a population of approximately 300, mainly VGFN members.

The Porcupine River sonar site is located approximately 2 km downstream of the community of Old Crow; this location has been used to enumerate chum salmon since 2010 (Figure 1). A cross-sectional bathymetric profile of the Porcupine River sonar site was developed in 2010, and showed that this site was suitable for the operation of split-beam sonar in the vicinity of the left and right bank deployment locations (see Snow 2010 for further information). The site is approximately 308 km downstream of the Whitestone and Miner river confluences, and approximately 322 km downstream of the Fishing Branch River confluence.

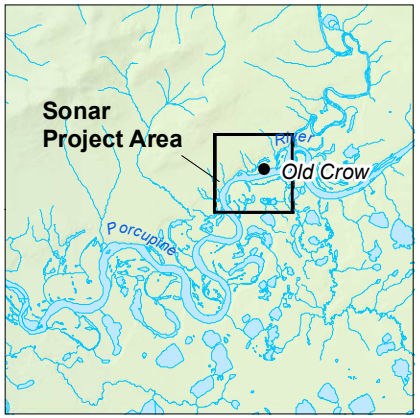

Figure 1. Overview Map of the 2013 Porcupine River Sonar Project Site

Legend

- Left downstream bank sonar transducer
- Right downstream bank sonar transducer

0 200 400 600 800 1,000

Metres

Map scale 1:5,000 (when printed on 8.5x11)

Drawn By:	L. Grieve
Checked By:	B. Snow
Date:	21 January 2013
Projection:	NAD 1983 UTM Zone 7
EDI Project #:	13-Y-0185

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2 METHODS

A crew of four people travelled to the Porcupine River sonar site on August 22 to setup the field camp and sonar equipment. This crew consisted of a biologist and technician from EDI Environmental Dynamics Inc. (EDI), and two VGFN field technicians.

Following initial setup, an EDI technician oversaw the field crew and the operations of the program. EDI staff operated on a rotation-base schedule for the duration of the program (at least one EDI staff member onsite at all times); the VGFN technicians were onsite throughout the program.

2.1 SONAR DEPLOYMENT

ARIS Explorer 1200 and 1800 multi-beam sonar systems were deployed on the left and right banks respectively. Each system consisted of a calibrated transducer, power cable and general purpose transceiver unit (GTP). The ARIS explorer transducers were affixed to an aluminum mount, similar to those used at other sonar enumeration sites. The mount allowed for easy adjustment to the transducer pitch and depth within the water column.

A power/data cable connected each transducer to a topside control box. Data was transmitted via Wi-Fi from the right downstream bank topside control box to a laptop computer on the left downstream bank using GNS-1151N wireless antennas; the topside box on the left downstream bank was connected to a lap top using a wired connection. This set up allowed all equipment to be operated from the left bank. The equipment was powered using one portable 2000 watt gas powered generator on each bank.

2.2 FISH DEFLECTION FENCE

In order to ensure that fish did not migrate behind the sonar emplacement, a fish deflection fence was set up to force fish offshore and in front of the transducer. To block off the shallow inshore areas, cobble walls were constructed and flexible chain link fencing was erected perpendicular to the river channel to extend the fence out into deeper water (to a depth of approximately 1.2 m; Photo 1). The fencing was supported using steel T-rail type stakes. After the fencing was erected, field staff keyed the bottom of the fence into the river bed material, to ensure that no chum salmon could pass underneath. The approximate total length of fence (fencing and cobble walls) was 31 m on the left bank and 8 m on the right bank. The fence was deployed approximately 2 m downstream of the sonar transducer on both banks (Photo 1). The transducers and mounts were placed a minimum of 3 m back from the end of each fence (towards the shore) to ensure that all fish passing in front of the fence were enumerated.

Photo 1. View of the fish deflection fence and transducer on the left bank of the Porcupine River sonar site, August 2013.

2.3 SONAR SOFTWARE SETUP AND DATA COLLECTION

ARIScope software was used to record all sonar data. The relevant parameters of this software were configured to match those used during the 2011 and 2012 sonar programs (Table 1.). All recorded data was backed up to a network-attached storage (NAS) drive. Data recorded to the NAS drive was recorded to two 3 TB hard drives, in a redundant RAID-array. This ensured that all recorded sonar data was secured in the event of a hard drive failure.

The sonar systems were powered on after the initial setup was completed and fine scale pitch and depth adjustments were made to optimize the sonar positioning. Sonar data was collected from August 24 to October 12, 2013.

Table 1. Summary of ARIS Explorer sonar parameters used during the 2013 chum salmon sonar program

ARIS Explorer Unit	Frequency Low/High (MHz)	Pulse Length (µs)	Beam Width (Horizontal/Vertical)	Frame Rate
1800	Low (1.1)	4-100	0.3º H/14º V	Max
1200	Low (1.1)	4-100	0.8º H/14º V	Max

2.4 ENUMERATION OF CHUM SALMON

Sonar data was reviewed using Echotastic version 3.0b1, a software package developed by Carl Pfisterer of the Alaska Department of Fish and Game. Echotastic allows for the reviewing of sonar data files and tallying of detected sonar targets. The enumeration methods consisted of reviewing an echogram of each collected sonar file, identifying fish targets with upstream motion and tallying all such targets within each file. An explanation of the counting process is detailed in the following sections.

2.4.1 Echogram Interpretation

An echogram is the visual representation of sonar data; it is a sound image based on sound frequency, intensity of returned echoes, and time. Echotastic provides a means to generate echograms from recorded ARIS/DIDSON sonar data files. Time is displayed on the horizontal axis and the distance from the front of the sonar transducer is displayed on the vertical axis. When using sonar to enumerate riverine fish, a series of horizontal lines through the entire Echogram is desirable; it indicates ensonification of the river bottom at all distances from the transducer. The user can view the entire echogram by scrolling vertically and/or horizontally.

2.4.2 Data Processing Parameters

Echotastic allows the user to specify a number of data processing options, to assist in viewing the echogram. A summary of the processing options used during the 2013 program and the rationale for each option is presented in Table 2. The field crew found these settings to be the most suitable for review of the collected data.

Table 2. Echotastic data processing options used during review of collected sonar data during the 2013 chum salmon sonar program.

Processing Option	Setting Used	Explanation of Setting	Rationale
Color Map	SIMRAD	Provides a full color spectrum picture of echogram	Ease of viewing
Color By Angle	On	Colors echogram data based on direction of horizontal travel of fish targets	Allows differentiation of upstream and downstream moving sonar targets.
Lower Threshold	-50 dB	Displays all sonar data stronger than -50 dB	Excludes sonar signals of lower intensity than -50 dB from the echogram; removes noise from image.
Color Background	Black	Displays sonar data against a black background.	Ease of viewing
Video Mode – Background	Off	Removes background data from the Echotastic video window	Ease of viewing

2.4.3 Identifying Fish Targets

Fish targets can be identified from Echotastic echograms based on shape and shadowing. Fish can usually be identified as small crescent or "wavy" targets (Figure 2) that are usually parallel to the river current. These targets are often seen within a narrow range from the front of the sonar transducer, which corresponds to areas of slower current along the river margins. This can aid in the separation of fish targets from non-fish targets. Fish also block a portion of the sonar beam as they travel through it, causing a shadowing of the area behind the fish. Shadowing is visible on an echogram as a dark vertical line behind the fish, extending away from the transducer. A shadow is visible behind the fish in the example echograms in Figure 2 and 3.

The ability to detect and discern fish targets is a skill that must be developed through practice; sonar technicians were shown examples of fish and non-fish targets at the beginning of the season, to provide search-image when reviewing files. EDI personnel also periodically reviewed collected data with technicians to help ensure all staff were correctly identifying fish targets.

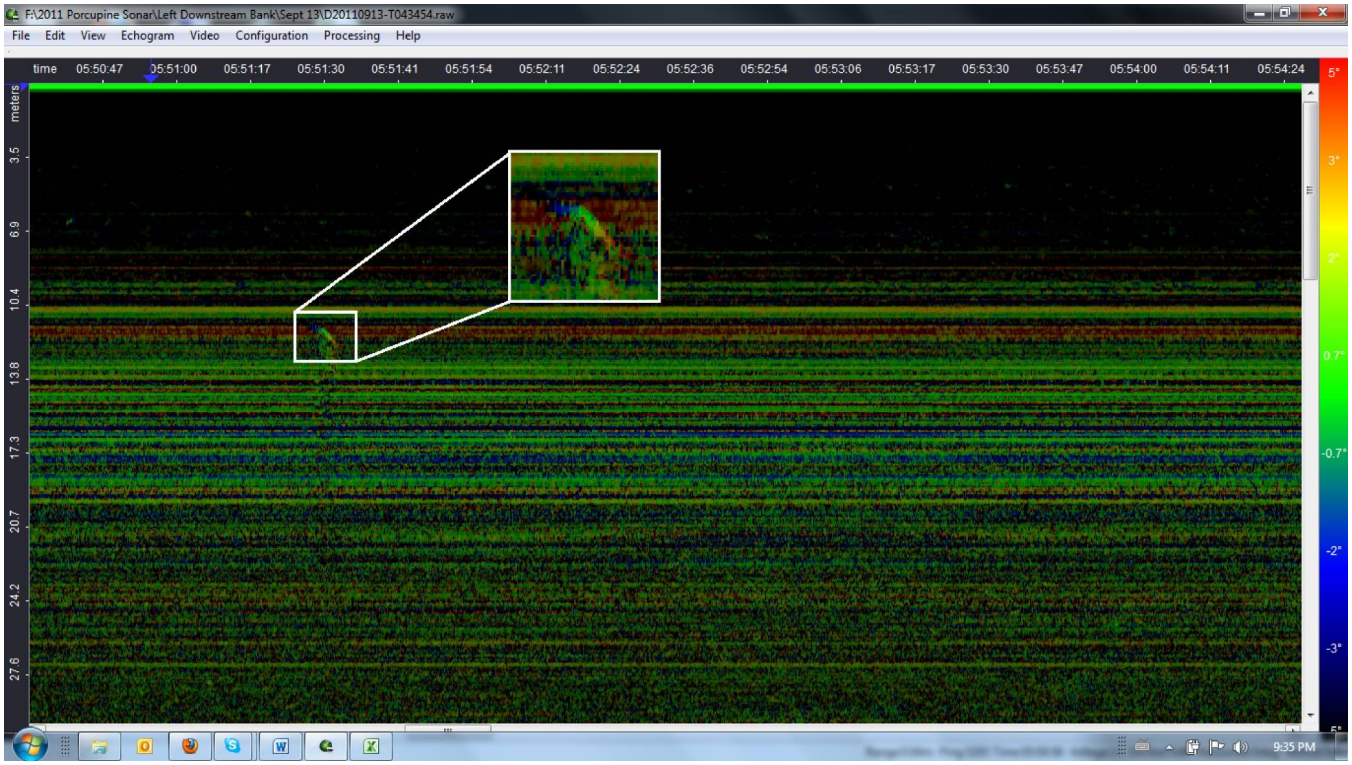

Figure 2. Echotastic echogram, showing the crescent or wave shape sonar targets and shadowing typical of a fish target.

2.4.4 Determining Direction of Travel and Tallying Targets

The direction of travel was determined for each fish identified during review of the sonar data. Direction of travel is determined by the angle of the offset (measure in degrees) of the fish from the center of the sonar

beam. As it passes through the sonar beam, the angle of offset of a fish target changes; the change of angle for an upstream moving fish is the opposite of that for a downstream moving fish.

When the reviewer enables the color by angle option in Echotastic, the echogram color scale provides a visual representation of the changes in angle offset. Hot colors (reds) represent movement in one direction while cold colors (blues) represent movement in the opposite direction. In this manner, fish moving upstream can be easily identified since they possess the opposite color spectrum orientation to that are moving downstream (Figure 3).

When the reviewer identifies a fish that is moving upstream, selecting the location of the fish on the echogram window marks the object with a pink box. When the review of the file is completed, the total number of marks is shown in a table (Figure 4). Saved marks can also be output to a text file for further processing and data analysis.

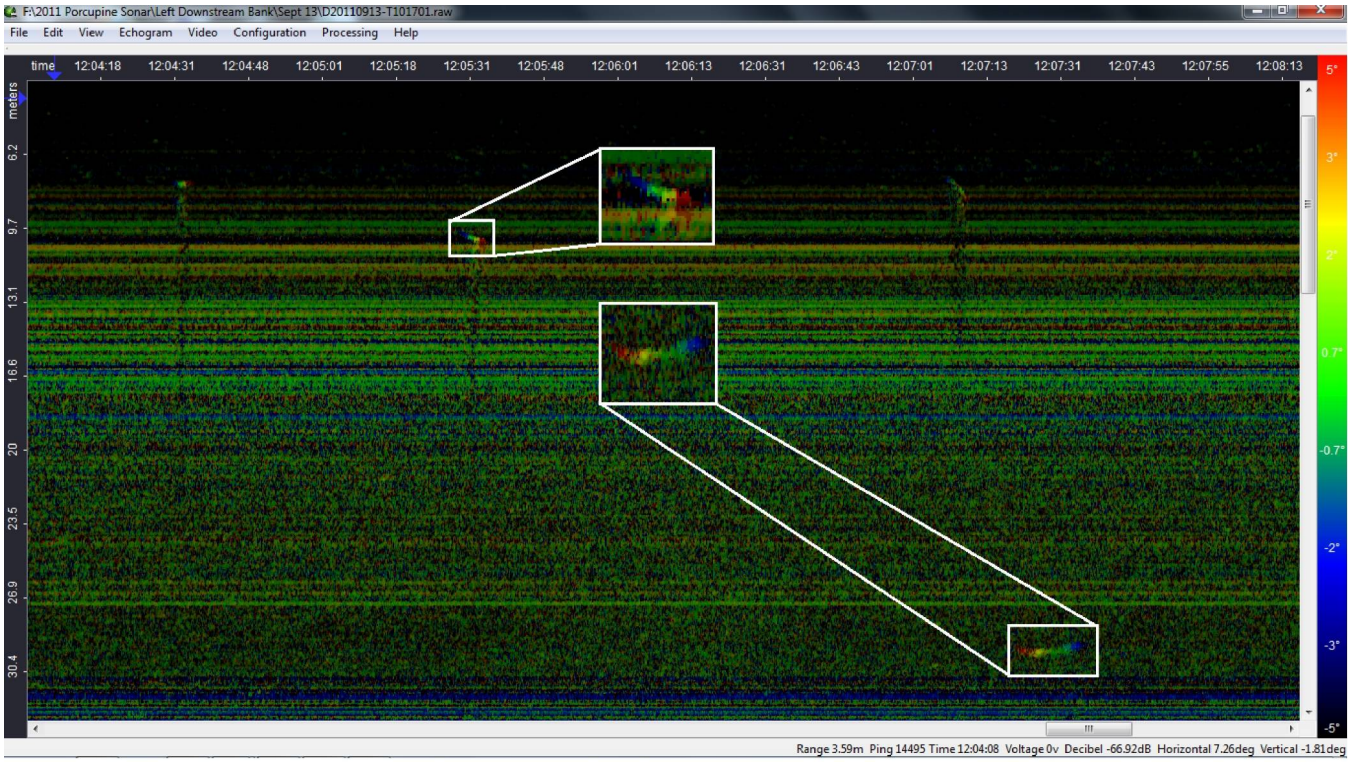

Figure 3. Echotastic echogram window showing two fish shaped sonar targets on the left bank of the Porcupine River sonar site.

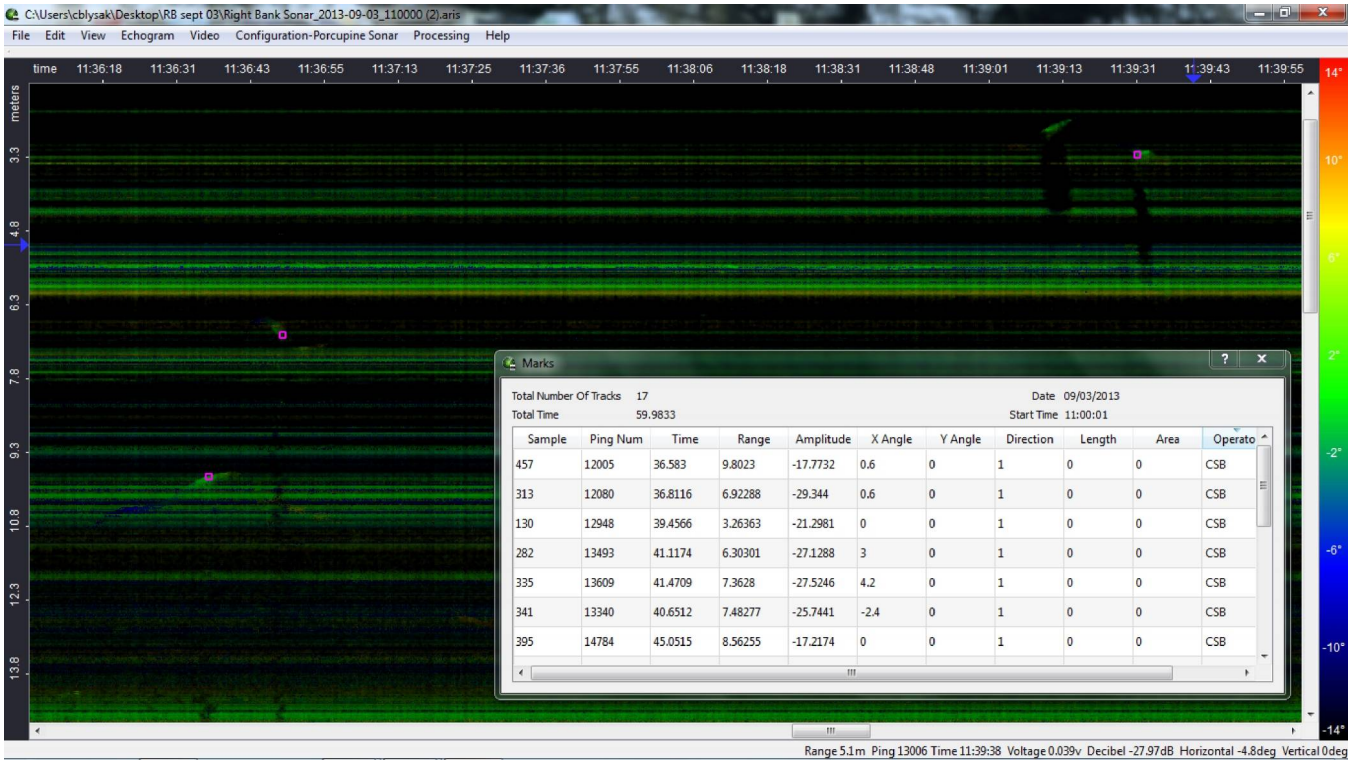

Figure 4. Echotastic echogram showing three fish and the mark table showing the total number of marked fish.

2.4.5 Interpolation of Count Data

During the operation of the sonar program, occasional equipment malfunctions and maintenance requirements resulted in periods when sonar data was not collected. For in-season reporting, missing data was interpolated by multiplying raw daily counts by the percentage of the day that was missing. This method provided a simple means for field staff to generate preliminary adjusted counts in time for twice weekly updates to be delivered.

Post-season (i.e. in this report), missing data was interpolated using different methods. The post-season methods of interpolation, for periods when portions of a day's data were missing, followed the methods used at the Eagle sonar station (Crane and Dunbar 2009). Three different interpolation methods were used, depending on how much data was being interpolated. All three methods are detailed in the below (Crane and Dunbar 2009):

> "When a portion of a sample was missing, on either bank, passage was estimated by expansion based on the known portion of the sample. The number of minutes in a complete sample period m_s was divided by the number of minutes counted m_i, and then multiplied by the number of fish counted x in that period i. Passage y_i was estimated as:

$$\hat{y}_i = \left(m_S / m_i\right) x_i$$

If data from one or more complete sample periods was missing, passage for that portion of the day y_m was estimated by averaging passage from the sample periods immediately before y_b and after y_a the missing sample period(s), and then multiplying by the number of sample periods missing n:

$$\hat{y}_m = \left(\frac{y_b + y_a}{2} \right) n$$

When multiple days were missing on only one side of the river (Sept 12 –Sept 20), passage for the period of missing days was estimated by determining a proportion of fish passing one bank, compared to the amount of fish passing the other bank, and averaging the proportions for the amount of days missing immediately before and after the missing sample period(s)."

In cases where interpolation formulas resulted in non-integer values, these values were lowered to the nearest integer value.

2.5 TEST NETTING

Drift netting was conducted from August 24 to October 5, 2013 to apportion the sonar counts between chum salmon and other fish species. Drift nets were 30.48 m (100 feet), with a mesh depth of 29 (3.05 m deep). Several different mesh sizes were used to capture adult fish species that may have been present in the river during the operational period of the program. Mesh sizes included 11.4, 12.7, and 15.2 cm (4.5, 5, and 6 inch, stretch diameter). All nets were hung at a 2:1 ratio. These nets were standardized to the same mesh sizes that were used in the 2011 and 2012 program.

Drift netting sets were conducted near the sonar site. Two types of drift netting sets were conducted:

- Offshore sets, where one end of the net is affixed to the boat and the other to a large orange float drifting freely in the river (Photo 2); and,
- Onshore sets, where one end is attached to the boat and the other end was pulled along the shore by a field crew member (Photo 3).

Photo 2. View of the field crew conducting an offshore drift netting set at the Porcupine River sonar site, September 2013.

Photo 3. View of field crew conducting an onshore drift netting set at the Porcupine River sonar site, September 2013

Drift netting that was conducted in 2011 showed that river currents on the right downstream bank were unsuitable for drift netting. All onshore drift netting in 2013 was conducted along the left downstream bank. Ten to fourteen sets were conducted each day; a different mesh size was used each day. All sets were approximately six minutes in duration. When fish were captured, they were removed from the net as quickly as possible. Fork length was recorded for all captured fish and sex was recorded for chum salmon; any other notable external observations were also recorded. In addition to the sex and length data, scale samples were collected from captured chum salmon. Three scales were taken for each captured chum salmon.

2.6 BATHYMETRY

As part of the 2013 field program, new bathymetric data was collected at the Porcupine River sonar site. This data was intended to improve on the resolution of the bathymetric data collected in 2010, and to help optimize the placement of sonar transducers in future years. Bathymetric data was collected using a Garmin 421s GPS integrated depth sounder, deployed from the stern of the project boat. Data was collected at 10 m intervals, while the boat transected the area of the sonar site. Transects were spaced at approximately 50 m intervals, perpendicular to the shoreline. Approximately 1.5 km of the Porcupine River were transected, including the location of the 2013 sonar site and several hundred meters upstream and downstream. A track log of the shoreline of the sonar site was collected using a handheld GPS, and was used to tie the collected bathymetric data to the shore of the Porcupine River.

3 RESULTS

3.1 SONAR DATA

3.1.1 Raw Weekly Counts

A summary of weekly sonar counts is presented in Table 3, daily count data is provided in Appendix A. A total of 33,042 upstream moving fish were identified from the collected sonar data (Table 3). The majority of these fish were counted on the left downstream bank of the sonar site. Weekly counts peaked on the left downstream bank during the week of September 15-21; on the right downstream bank weekly counts peaked during the week of September 1-7. Daily counts are included in Appendix A, and suggest that a small proportion of the run may have passed the site prior to the start of program operations and a considerably larger portion may have passed after program operations ceased.

Table 3. Raw weekly counts of upstream moving fish at the Porcupine River sonar site, 2013.

Program Week	Weekly Counts		
	Left Bank Count	Right Bank Count	Combined Count
August 24 [A]	132	0	132
August 25 - August 31	2,542	692	3,234
September 1 - September 7	3,422	1,791	5,213
September 8 - September 14	3,809	476	4,285
September 15 - September 21	7,613	105[b]	7,718[B]
September 22 – September 28	5,842	621	6,463
September 29 - October 5	2,999	638	3,637
October 6 - October 12	1,685	675	2,360
Totals	**28,044**	**4,998**	**33,042**

[A]Partial week, includes the first day of counts.

[B]Sonar hardware failure on the right bank; no counts from September 12 to 20.

3.2 TEST NETTING

A summary of weekly drift netting results is presented in Table 4; daily drift netting results are included in Appendix B. During the operation of the drift netting test fishery, 52 fish were captured. Nearly all of the captured fish were chum salmon (51, or 98% of the total catch); the only other fish captured was an inconnu (*Stenodus leucichthys*).

Table 4. Summary of weekly drift netting catches at the Porcupine River sonar site in 2013.

Program Week	Chum Salmon Captured	Resident Fish Captured	Total Fish Captured	Chum Proportion (%)
August 24[A]	1	0	1	100
August 25- August 31	14	1	15	93.3
September 1 - September 7	9	0	9	100
September 8 - September 14	5	0	5	100
September 15 - September 21	10	0	10	100
September 22 - September 28	12	0	12	100
September 29 - October 5	0	0	0	0
October 6 - October 12	0	0	0	0
Total	**51**	**1**	**52**	**98.08**

[A]Partial week, includes the first day of counts.

A weekly summary of sex and length distributions of captured chum salmon is shown in Table 5. Male chum salmon were captured more frequently than females and were, on average, approximately 8 cm longer. Scale sample were delivered to DFO for analysis at the end of the field program; the results of the ageing analysis were not yet completed at the time this report was written.

Table 5. Summary of weekly fall chum salmon sex and length data at the Porcupine River sonar site in 2013.

Program Week	Male			Female		
	Total Captured	% of Total	Mean Length (cm)	Total Captured	% of Total	Mean Length (cm)
August 24[A]	1	0	-	1	100	63.0
August 25 - August 31	12	85.7	68.5	2	14.3	64.5
September 1 - September 6	6	66.6	74.6	3	33.3	61.3
September 7- September 14	5	100	71.0	0	0.0	-
September 15 - September 21	6	60.0	68.8	4	40	65.0
September 22 - September 28	7	63.6	69.1	4	36.4	62.0
September 29 - October 5	0	0	0	0	0	0
October 6 - October 12	0	0	0	0	0	0
Total	**37**	**-**	**-**	**14**		
Program Mean		**71.1**	**70.5**		**26.9**	**63.1**

[A]Partial week, includes the first day of counts

3.3 BATHYMETRY

The bathymetric map developed from the data collected in 2013 is shown in Figure 5. The bathymetric profile of the sonar site appears to be similar to profile that was mapped in 2010 (EDI 2011) and is conducive to sonar operation (Figure 5). This section of river was chosen for generally even bottom profiles and its relatively narrow width, allowing for the majority of the river to be insonified. The sonar transducer deployment location on the left bank of the Porcupine River sonar site has a bathymetric profile that slopes smoothly and gradually towards the thalweg, reaching a depth of approximately 4.5 m. The sonar transducer deployment location on the right bank of the Porcupine River sonar site is in an area of the river which is sloped more steeply, but which consistently slopes towards the thalweg at 4.5 m.

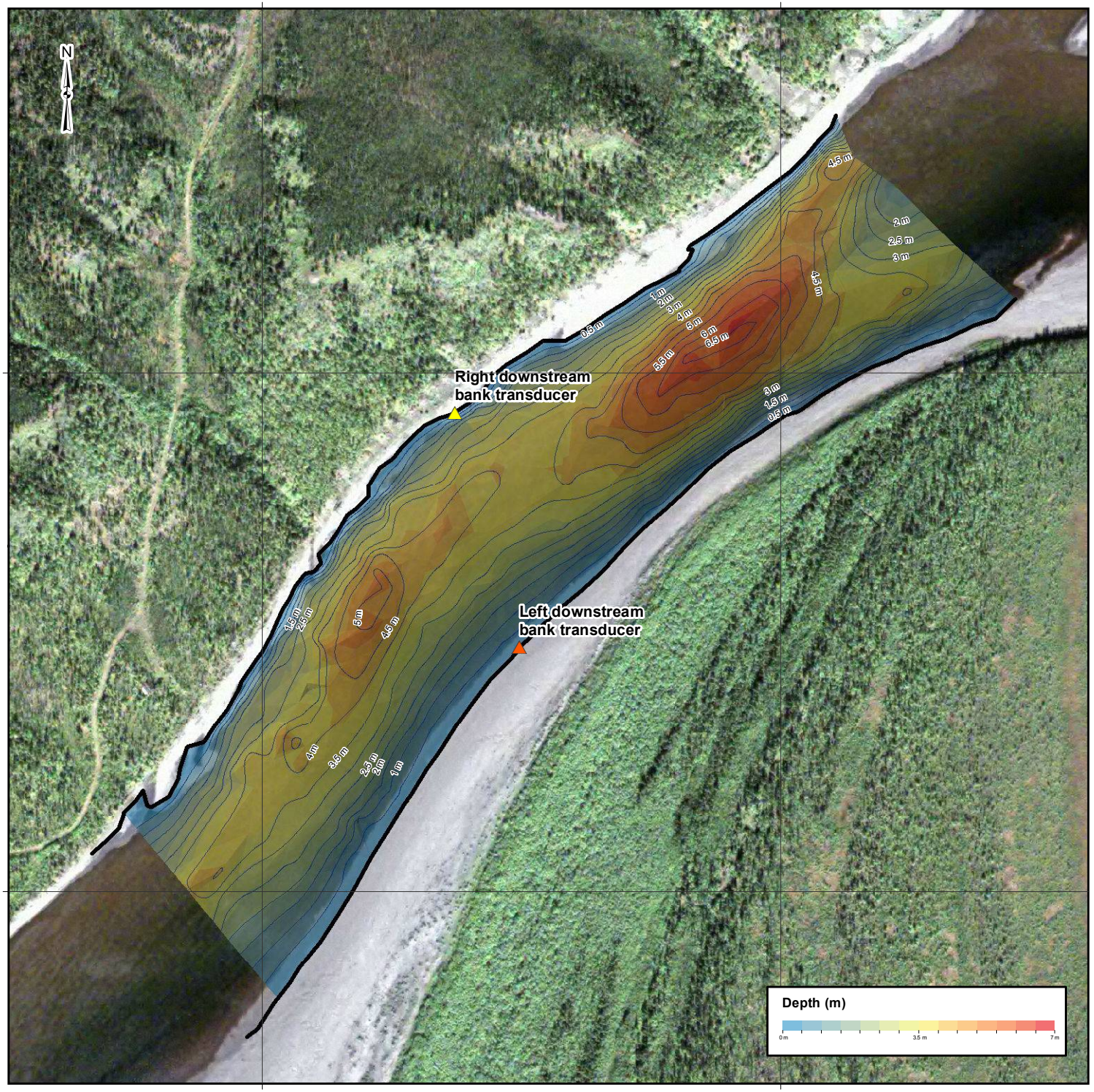

Figure 5. Porcupine River Sonar Site Bathymetry

Legend

- Left downstream bank sonar transducer
- Right downstream bank sonar transducer
- Bathymetric Contour (0.5m interval)
- Shoreline

0 50 100 150 200

Metres

Map scale 1:5,000 (when printed on 8.5x11)

Drawn By:	L. Grieve
Checked By:	B. Snow
Date:	21 January 2013
Projection:	NAD 1983 UTM Zone 7
EDI Project #:	13-Y-0185

Quickbird image provided courtesy of Yukon Government - Geomatics and used under licensed restrictions (18 June 2005).

Project specific features were derived/digitized by EDI Environmental Dynamics Inc. (2011).

1:50,000 National Topographic Database (NTDB) features downloaded from spatial data warehouse - www.geogratis.gc.ca. Her Majesty the Queen in Right of Canada, Department of Natural Resources. All rights reserved.

Digital Elevation Model provided by Geomatics Yukon - Yukon Government via online source (Corporate Spatial Warehouse) www.geomaticsyukon.ca.

This document is not an official land survey and the spatial data presented is subject to change without any notice.

EDI

Vuntut Gwitchin First Nation

J:\Yukon\Projects\2013\13_Y_0185_VGG_Porcupine_River_Chum_Salmon_Sonar\Mapping\Fig5_SonarSite_Bathy_29Jan2014.mxd

3.4 RIGHT BANK TRANSDUCER MALFUNCTION

On September 12, 2013 the ARIS 1800 unit malfunctioned resulting in the unit displaying a blank screen, with no bottom visible. The field crew adjusted the aim of the sonar from side to side, and up and down without any observable change. After troubleshooting, trying different settings and discussing the issue with a SoundMetrics Inc. representative on the phone, it was determined that the sonar lens focus motor on the unit was defective and had to be sent back to the manufacturer for warranty repairs. The remaining functional ARIS sonar unit was maintained in operation on the left bank, where the majority of the chum salmon normally migrate. On September 14 the defective ARIS sonar unit was sent back to SoundMetrics in Bellevue, Washington and a DIDSON multi-beam sonar unit was provided by SoundMetrics while the ARIS sonar was being repaired. Until the loaned DIDSON unit arrived; no sonar data could be collected on the right bank (between September 12 and September 20). The warranty repairs were not completed on the ARIS sonar system until early October, and it was decided to continue using the loaned DIDSON multi-beam sonar unit for the duration of the project. Aside from the focus motor malfunctioning on the right bank ARIS 1800 unit, the ARIS sonar systems were effective in insonifying the Porcupine River and detecting migrating chum salmon.

4 DISCUSSION

4.1 DEVELOPMENT OF LOCAL CAPACITY

An important goal of the 2013 sonar program was to continue developing local capacity within the community of Old Crow to conduct this and other programs in the community. While a number of past programs (e.g., mark- recapture and CPUE [Catch per unit effort] index programs) have helped to develop fisheries technical capacity within the community, this particular program provides several important advantages.

- The program offered approximately 8 weeks of continuous fisheries related work to two individuals;
- The skills needed to operate the sonar system and conduct drift netting provided new learning opportunities for local technicians; and,
- The program provides a means to retain skilled fisheries technicians in the community, while also providing experience to younger community members who have not been involved in past programs.

In total, four local field technicians were trained and participated in this program. Field technicians conducted much of the onsite review of sonar files and drift netting necessary for this success of this program. The knowledge of the day-to-day operation of a hydro-acoustic enumeration site is a specialized skill and there is currently a considerable amount of interest within the community of Old Crow to pursue future sonar related programs for stock assessment purposes. If the current sonar program develops into a permanent stock assessment initiative, there is potential for the program to eventually be run entirely using local field technicians with professional assistance and support provided as needed. Recommendations in Section 5 are intended to assist with transitioning the program to local operation in the future.

4.2 EFFECTIVENESS OF MULTI-BEAM SONAR

Split-beam sonar was used to enumerated chum salmon on the Porcupine River from 2009 to 2012; it was initially chosen due primarily to the fact that the river is wide at the Old Crow sonar site and could not be fully insonified with the available multi-beam sonar systems (DIDSON or ARIS), which have a maximum operating range of 40 m. Split-beam sonars can insonify a wider portion of the river channel, which allows for detection of fish targets further offshore; however, 2011 and 2012 sonar data showed that chum salmon are bank oriented in the vicinity of the Old Crow sonar site and that a negligible amount of chum salmon migrate further than 20 m offshore of the sonar transducer (EDI 2011; EDI 2012). The switch was made to ARIS multi-beam sonars for this year's program for the following reasons. First, ARIS sonar provides a video like display of sonar data that can be used to help differentiate between migrating salmon and other fish species. Second, ARIS sonar is less complex to operate than the comparable split-beam systems. It provides a more intuitive interface, and is easier to teach to field staff. Third, the ARIS sonar was less impacted by turbulent water conditions than the split beam sonars. The previous SIMRAD sonars suffered from considerable increases in background "noise" when windy conditions created waves on the Porcupine

River at the sonar site. Use of the ARIS sonar produced more favorable images in these conditions, which do occur periodically on the Porcupine River. These characteristics are important for the Porcupine River where seasonal field staff turnover rates are high and weather conditions can be challenging.

4.3 INTERPOLATION OF MISSING RIGHT BANK COUNT DATA

4.3.1 In-Season Interpolation of Right Bank Count Data

Due to the malfunction of the ARIS 1800, nine days of sonar data on the right bank were missing from the peak of the run. This large amount of missing data required a different approach to interpolation than the methods described in Section 2.4.5. A new method for in-season estimation of chum salmon passage on the right bank from September 12 to 20 was developed in consultation with DFO and ADF&G staff, to allow for a weekly total chum salmon passage estimate during this period. This estimate was developed by reviewing the historical (2011 and 2012) and available 2013 daily sonar counts to determine the relative proportion of chum salmon that migrated on each bank of the river. It was determined that, on average, the right bank counts were 22% of the left bank counts. The missing daily right bank counts from September 12 to 20 were therefore interpolated by multiplying the corresponding daily left bank counts during this period by 0.22 (Table 6). The total weekly interpolated counts derived using the in-season interpolation proportion of 22% are shown in Table 7.

Table 6. Interpolated daily right bank count data from the Porcupine River sonar site for the period of September 12 to 20, 2013, using the in-season right bank proportion of 22% of left bank counts (Blue text is interpolated data).

Date	Left Bank Raw Count	Left Bank Interpolated	Right Bank Raw Count	Right Bank Proportion (%)	Right Bank Interpolated	Both Banks Interpolated
12-Sep-13	435	556	0	22.0	122	678
13-Sep-13	503	503	0	22.0	111	614
14-Sep-13	706	706	0	22.0	155	861
15-Sep-13	866	866	0	22.0	191	1,057
16-Sep-13	920	920	0	22.0	202	1,122
17-Sep-13	1,270	1,285	0	22.0	283	1,568
18-Sep-13	1,075	1,087	0	22.0	239	1,326
19-Sep-13	1,269	1,269	0	22.0	279	1,548
20-Sep-13	1,135	1,202	0	22.0	264	1,466
Totals	**8,179**	**8,394**	**0**	**--**	**1,846**	**10,240**

Table 7. **Interpolated weekly count data for the Porcupine River sonar site in 2013, using the in-season right bank proportion of 22% of left bank counts.**

Program Week	Weekly Counts			Interpolated Weekly Counts		
	Left Bank Count	Right Bank Count	Combined Count	Left Bank Count	Right Bank Count	Combined Count
August 24[A]	132	0	132	132	0	132
August 25 - August 31	2,542	692	3,234	2,548	705	3,253
September 1 - September 7	3,422	1,791	5,213	3,603	1,846	5,449
September 8 - September 14	3,809	476	4,285	3,918	885	4,755
September 15 - September 21	7,613	105[b]	7,718[B]	7,707	1,564	9,087
September 22 – September 28	5,842	621	6,463	5,842	674	6,516
September 29 - October 5	2,999	638	3,637	3,139	698	3,837
October 6 - October 12	1,685	675	2,360	1,706	891	2,597
Totals	**28,044**	**4,998**	**33,042**	**28,595**	**7,264**	**35,859**

[A]Partial week, includes the first day of counts.

[B]Sonar hardware failure on the right bank; no counts from September 12 to 20.

4.3.2 Post-Season Interpolation of Right Bank Count Data and Development of Final Chum Passage Estimate

Post-season, the missing right bank sonar data was revisited to see if a more precise method of interpolating the missing data could be developed. The nine days of missing right bank counts in 2013 occurred during the period of peak counts on the left bank (Table 3), and it was suspected that the ratio of left bank to right bank counts during the peak of the run could differ between years. The nine days of peak left bank counts in 2011 and 2012 were examined to determine the relative proportion of chum salmon that migrated on each bank during these periods. It was found that the relative proportion of chum salmon that migrated on each bank differed considerably between the 2011 and 2012 peak run periods (Table 8 and Table 9). During the peak of the 2011 run, the right bank counts were 21.32% of the left bank counts, on average (Table 8) whereas this proportion was 33.83% in 2012 (Table 9). This difference between years suggested that there may be considerable inter-annual variation in the relative chum salmon passage rates on the right and left banks of the Porcupine River sonar site.

Table 8. Proportion of right bank total counts, relative to left bank total counts at the Porcupine River sonar site in 2011.

Year	Date	Right Bank Proportions (%)
2011	September 12	8.39
2011	September 13	10.83
2011	September 14	21.11
2011	September 15	30.51
2011	September 16	37.79
2011	September 17	15.17
2011	September 18	25.48
2011	September 19	23.49
2011	September 20	19.08
	Average	**21.32**

Table 9. Proportion of right bank total counts, relative to left bank total counts at the Porcupine River sonar site in 2012.

Year	Date	Right Bank Proportions (%)
2012	September 12	29.40
2012	September 13	26.56
2012	September 14	29.00
2012	September 15	29.32
2012	September 16	34.77
2012	September 17	38.63
2012	September 18	45.00
2012	September 19	35.99
2012	September 20	35.83
	Average	**33.83**

The inter-annual variation in chum salmon migration patterns was suspected to be due to differences in waters levels; previous mark-recapture and CPUE index programs (EDI 2011) indicated that chum salmon migratory behaviour changed in response to changes in water levels in the Porcupine River. The malfunction of the ARIS 1800 in 2013 coincided with a rapid increase in water level, and it was suspected that this could have resulted in different chum salmon migratory behaviour during this period.

Water level data recorded at a Water Survey of Canada gauging station on the Porcupine River near the Canada/US border (station 09FD002) was reviewed to investigate differences in water levels during the 2011, 2012 and 2013 chum salmon runs. As shown in Figure 6, the water levels during the period of sonar operation in these three years differed considerably. Water levels in 2013 were the highest of all three years during the period of September 13 and September 19, when the ARIS 1800 was not operating. Water levels were also the most variable between program years during this period. Based on the notable difference in water levels during the peak run period of all three program years, it was determined that using 2011 and 2012 sonar data (specifically, the right bank: left bank proportion data) to interpolate the missing 2013 right bank data was likely resulting in a somewhat inaccurate estimate of chum salmon passage for this period.

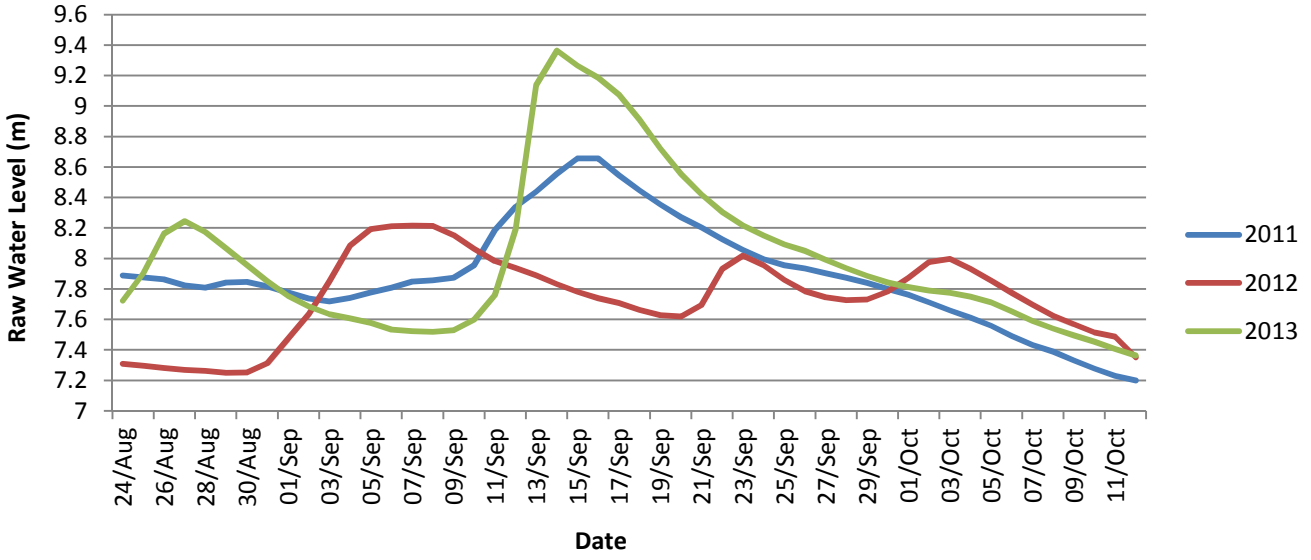

Figure 6. **Daily mean raw water level data for the Porcupine River during the period of operation of the Porcupine River sonar program in 2011, 2012 and 2013. Water levels measured at station 09FD002, near the Canada/U.S. border.**

In response to the suspected inter-annual variation in chum salmon passage rates, a revised post-season interpolation was conducted using only 2013 data. The average proportions of right bank counts relative to left bank counts were calculated for the week before and after this missing data period. The week before and after the missing data was chosen because the right/left bank proportional counts were most similar during this period. The right/left bank proportion was determined to be 19.2%, which is lower than the proportions observed during 2011 and 2012 (Table 8 andTable 9). The revised, post-season interpolated right bank daily passage estimates from September 12 to 20, 2013 are shown in Table 10. The relatively low estimated passage on this right bank of the Porcupine River during the 2013 high water event is consistent with the expected migratory behaviour of chum salmon. The right bank of the sonar site is on an outside bend of the river and during high water, water velocities would likely be highest on this side of the river and a greater proportion of chum salmon would likely migrate in the slower moving water along the left bank.

Table 10. **Interpolated daily sonar count for the Porcupine River sonar site for the period of September 12 to 20, 2013, using the post-season right bank proportion of 19.2% of left bank counts (Blue text is interpolated data).**

Date	Left Bank Raw Count	Left Bank Interpolated	Right Bank Raw Count	Right Bank Proportion (%)	Right Bank Interpolated	Both Banks Interpolated
5-Sep-13	481	481	181	37.63	194	675
6-Sep-13	553	553	223	40.33	223	776
7-Sep-13	588	602	153	26.02	153	755
8-Sep-13	618	618	115	18.61	143	761
9-Sep-13	496	496	123	24.80	123	619
10-Sep-13	511	511	123	24.07	123	634
11-Sep-13	528	528	108	20.45	108	636
12-Sep-13	435	556	0	19.25	107	663
13-Sep-13	503	503	0	19.25	97	600
14-Sep-13	706	706	0	19.25	136	842
15-Sep-13	866	866	0	19.25	166	1,032
16-Sep-13	920	920	0	19.25	177	1,097
17-Sep-13	1,270	1,285	0	19.25	247	1,532
18-Sep-13	1,075	1,087	0	19.25	209	1,296
19-Sep-13	1,269	1,269	0	19.25	244	1,513
20-Sep-13	1,135	1,202	0	19.25	231	1,433
21-Sep-13	1,078	1,078	105	9.74	106	1,184
22-Sep-13	1,024	1,024	113	11.04	113	1,137
23-Sep-13	866	886	98	11.32	98	984
24-Sep-13	868	868	96	11.06	96	964
25-Sep-13	821	821	122	14.86	122	943
26-Sep-13	786	786	65	8.27	77	863
27-Sep-13	732	732	83	11.34	83	815
Totals	**18,129**	**18,378**	**1,708**	**--**	**3,376**	**21,754**

4.4 FINAL 2013 CHUM SALMON PASSAGE ESTIMATE

The primary goal of the 2013 Porcupine River chum sonar project was to enumerate chum salmon passing the community of Old Crow. The revised interpolated weekly counts using the 2013 post-season right/left bank proportion of 19.2%, are shown in Table 11. The final interpolated estimate of chum salmon that migrated past the Porcupine River sonar site during its period of operation in 2013 is 35,626. The entire estimate is apportioned as chum salmon; the rationale for this apportionment is further discussed in the following sections.

Table 11. Final, post-season interpolated weekly sonar counts from the Porcupine River sonar site in 2013.

Program Week	Weekly Counts			Interpolated Weekly Counts		
	Left Bank Count	Right Bank Count	Combined Count	Left Bank Count	Right Bank Count	Combined Count
August 24[A]	132	0	132	132	0	132
August 25 - August 31	2,542	692	3,234	2,548	705	3,253
September 1 - September 7	3,422	1,791	5,213	3,603	1,846	5,449
September 8 - September 14	3,809	476	4,285	3,918	837	4,755
September 15 - September 21	7,613	105	7,718	7,707	1,380	9,087
September 22 – September 28	5,842	621	6,463	5,842	674	6,516
September 29 - October 5	2,999	638	3,637	3,139	698	3,837
October 6 - October 12	1,685	675	2,360	1,706	891	2,572
Totals	**28,044**	**4,998**	**33,042**	**28,595**	**7,031**	**35,626**

[A]Partial week, includes the first day of operation of the sonar program.

4.4.1 Species Composition of Sonar Counts

The high capture rates of chum salmon in the drift netting fishery in 2013 (98.08 %; Table 12) indicates the vast majority of counted fish targets were chum salmon. Only a single freshwater fish was captured, and more importantly no other salmon species were captured. Test netting results were similar in 2011 and 2012 (97.2% and 92.4% respectively, of fish captured in the drift net fishery were chum salmon; EDI 2012). The high capture rates of chum salmon in all three years of test fishing strongly suggests that chum salmon constitute nearly all of the fish targets that are identified on the sonar.

Prior to the operation of the Porcupine River sonar program, a chum salmon Mark-Recapture/CPUE index program was used to estimate the abundance of chum salmon migrating past Old Crow. This program used set (i.e., stationary) gill nets and was operated during the same season as the Porcupine Sonar program (mid/late August to late September) from 2003 to 2010. During Mark-Recapture and CPUE index program operation, very few resident fish species were captured (Table 12), despite the use of appropriately sized net meshes for similarly sized resident fish species. Negligible amounts of coho and Chinook salmon were captured during previous studies, and in several years none were captured at all (Table 12). These data show that the low number capture rates of resident fish, and coho and Chinook salmon do not scale with an increasing sampling size of chum salmon. It is estimated that the number of coho, Chinook and resident fish species counted from 2013 sonar data may account for several dozen fish, less than 1% of the 2013 program estimate.

Table 12. Summary of salmon and resident fish species captured during chum salmon stock assessment programs near Old Crow from 2003 to 2013.

Program Type	Year	Species of Fish Captured			
		Chum Salmon	Resident Fish[A]	Coho Salmon	Chinook Salmon
Mark-Recapture	2003	616	9	2	0
Mark-Recapture	2004	2,463	18	0	1
Mark-Recapture	2005	5,478	12	2	0
Mark-Recapture	2006	2,193	155	1	0
Mark-Recapture	2007	3,452	30	7	4
Mark-Recapture	2008	1,797	15	1	0
CPUE Index	2009	398	20	0	0
CPUE Index	2010	182	21	0	1
Sonar Test Netting	2011	71	2	0	0
Sonar Test Netting	2012	122	10	0	0
Sonar Test Netting	2013	51	1	0	0

Notes: [A] Includes inconnu, northern pike, broad whitefish (*Coregonus nasus*), burbot (*Lota lota*), longnose sucker (*Catostomus catostomus*), least cisco (*Coregonus sardinella)* and Arctic grayling (*Thymallus arcticus*).
Data Sources: Anderton (2003), Schonewille and Anderton (2004, 2006), Schonewille (2005, 2008), Snow (2009, 2010), EDI (2011, 2012, 2013).

Test netting results from 2013, 2012 and 2011 and past chum Mark-Recapture/CPUE index studies all support the conclusions that the overwhelming majority of fish detected on the sonar are chum salmon and that other fish species account for a negligible proportion of sonar counts.

Chum salmon captures while drift netting were considerably lower in 2013 than previous years, despite conducting more drifts and the run being larger. This is likely due to a couple of different factors. Lower catches may be due to higher water during the peak of the run, likely resulting in changes to fish migration patterns. In past CPUE and mark-recapture programs, set net catches would drop during high water events. Another reason for lower chum salmon catches was crew shortages at several times during the operation of the field program. In 2013, there was a relatively high turnover a local field technicians, and drift netting operations were scaled back when the crew was shorthanded.

4.5 ESTIMATE OF FISHING BRANCH RIVER WEIR CHUM SALMON ESCAPEMENT

The Fishing Branch River chum salmon enumeration weir operated in the upper Porcupine River drainage on a continuous seasonal basis from 1991 to 2012, with periodic seasonal operation prior to 1991. The program was discontinued after 2012, and chum salmon stock assessment on the upper Porcupine River was transferred to the Old Crow sonar site. In 2011 and 2012, sonar counts were compared to weir counts to help aid in the transition from weir based chum salmon escapement estimates to sonar based escapement estimates. To provide a third year of comparative data, a chum salmon radio tagging program was conducted at the Old Crow sonar site in 2013. This tagging program estimated that 74.1% of chum passing the weir site (not including harvested fish) were destined for spawning areas upstream of the inactive weir site (Table 13; EDI 2014). An estimated 26,398 chum salmon spawned upstream of the weir in 2013. This proportion is similar to 2011 and 2012 (Table 13). Additional information on the tagging program is provided in a separate report (EDI 2014).

Table 13. **Comparison of harvest adjusted Porcupine River sonar and Fishing Branch River weir chum salmon passage estimates from 2011 and 2012(EDI 2012, EDI 2013, EDI 2014) and 2013 radio telemetry data. The Fishing Branch River weir estimate for 2013 is derived from the adjusted proportion of radio tag detections upstream of the weir site.**

Year	Harvest Adjusted Porcupine River Sonar Estimate	Equivalent Fishing Branch River Weir Count	Proportion of Sonar Estimate (%)
2011	10,938	8,574	78.3
2012	27,793	21,561	77.5
2013	34,226	26,398	74.1

4.6 RUN TIMING AND STRENGTH

Sonar data collected from 2011 to 2012 form the basis for the analysis of run strength and timing, and will provide important information on these aspects of the Porcupine River chum salmon run in future years. The three years of data collected thus far are presented and discussed in brief; more detailed analysis on run timing and run strength data trends will become possible once additional years of data are collected.

Cumulative daily interpolated sonar counts from 2011, 2012 and 2013 provide a means to compare the relative run strengths of the three years (Figure 7). This comparison suggests that 2013 was a larger run than 2011, but may have been smaller than 2012. The 2012 sonar program was shut-down on September 29; however, a considerable number of fish were still migrating past the sonar site and the cumulative counts in the final days of the 2012 sonar operations appear to be slightly higher than 2013 (Figure 8). It should also be noted that chum salmon were still migrating past the Old Crow sonar site when the program was shut-down on October 12, 2013.

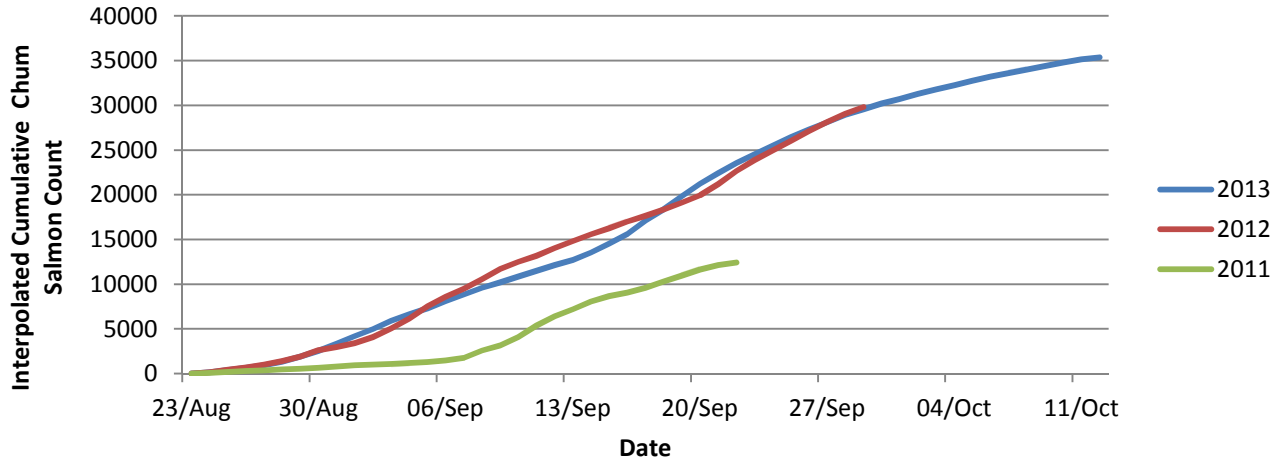

Figure 7. **Comparison of cumulative daily interpolated sonar counts at the Porcupine River sonar site in 2011, 2012, and 2013.**

A comparison of 2011, 2012, and 2013 interpolated counts of chum salmon at the Old Crow sonar site, shown in Figure 8, provides insights on differences in run timing between the three years. It is clear that the peak of the run was earliest in 2011 (September 11) and later in both 2012 (September 22), and 2013

(September 17). The 2011 run shows a single peak but both the 2012 and 2013 runs show two distinct peaks. In both 2012 and 2013, the first peak is slightly smaller than the second, suggesting a bi-modal distribution (Figure 8). This distribution is somewhat unexpected, as previous Mark-Recapture and CPUE index programs on the Porcupine River suggested that chum salmon runs most often have a single, distinct peak.

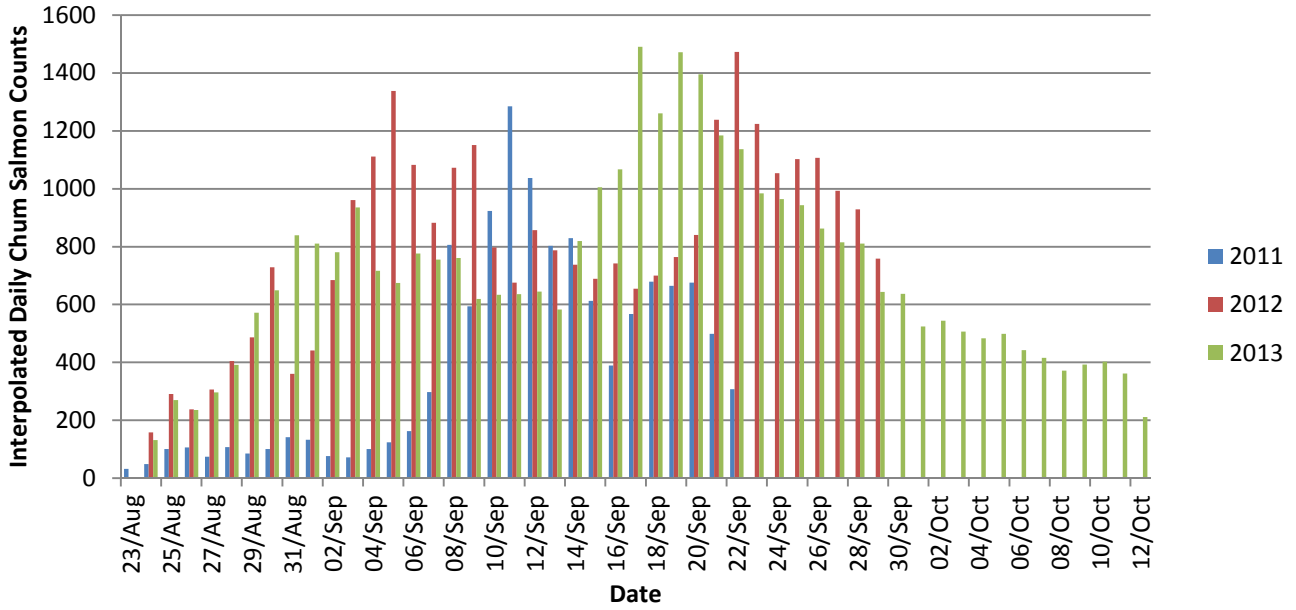

Figure 8. Comparison of daily interpolated sonar counts at the Old Crow sonar site in 2011, 2012, and 2013.

The suggested bi-modal distribution of chum salmon sonar counts that was observed in 2012 and 2013 is likely reflective of two pulses of chum salmon migrating past the sonar site, this supposition is supported by a similar distribution of daily counts at the Fishing Branch weir during the equivalent time period in 2012 (i.e., offset by 12 days).

4.7 CHUM SALMON BANK ORIENTATION

The text files output by Echotastic during the review of collected sonar data include a measurement of the distance of each fish target from the sonar transducer. From 2011 to 2013, nearly all detected fish targets were within 20 m of the sonar transducers on the left bank (Figure 9) and right bank (Figure 10) of the river. The target range data collected from 2011 to 2013 show that chum salmon are strongly bank oriented on both the left and the right downstream banks of the Porcupine River sonar site. A similar bank orientation pattern has been documented for chum salmon migrating past the Sheenjek River sonar site (Dunbar 2012). These findings also account for the near complete lack of catches in offshore drift net sets in from in 2011, 2012 (EDI 2012; EDI 2013) and 2013. In all years, fish captures were overwhelmingly in the inshore area of the left bank, where river velocities are relatively low.

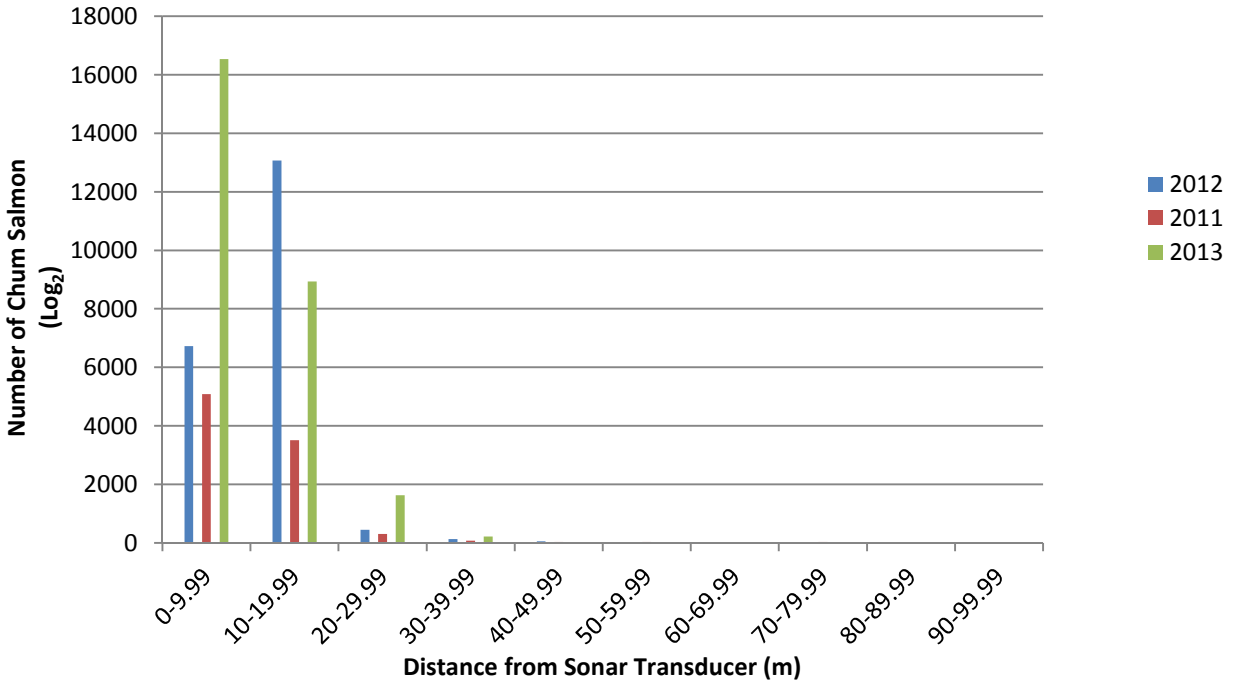

Figure 9. Range of chum salmon with upstream motion detected on the left bank of the Porcupine River sonar site in 2011, 2012, and 2013.

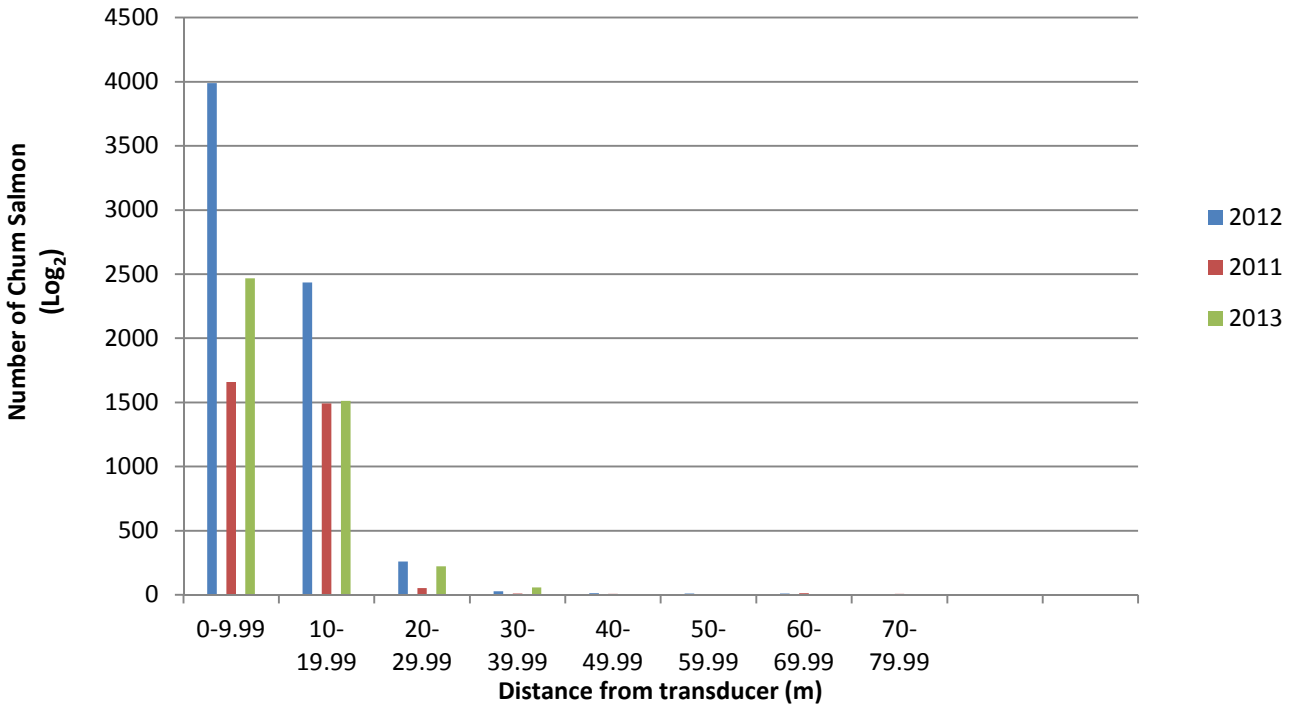

Figure 10. Range of chum salmon with upstream motion detected on the right bank of the Porcupine River sonar site in 2011, 2012, and 2013.

5 RECOMMENDATIONS

Over the past years of the Porcupine River chum salmon sonar program, several recommendations have been implemented with success. Some new recommendations that could benefit the sonar operation are included below.

- The bathymetric data collection and mapping conducted in 2013 show that the bottom profile at this Porcupine River sonar site is consistent with the data from 2010; the profile does not appear to have changed significantly. It is recommended that additional bathymetric data collection be conducted in several years to confirm the profile remains stable.

- A more portable weir/fish deflection fence would be a great help during periods of fluctuating water levels; a conduit weir or similar structure would be suitable for this purpose. If an ice road to Old Crow is constructed in the winter of 2014, this could provide an opportunity to bring this material in at a low cost (relative to air cargo).

- Investigations into alternate power sources, including renewable energy sources, could benefit the program over the long term.

- In-season preliminary counts should be posted outside the VGG administarion building, in a location that is visible and easily accessible to the community members; this would help build community support for the program.

- If an ice road is built in the winter of 2014, supplies to construct a permanent camp could be brought in.

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6.2 SPATIAL DATA

1:50,000 CanVec topographic data from Government of Canada, Natural Resources Canada, Earth Sciences Sector, Centre for Topographic Information. Geogratis website (http://geogratis.cgdi.gc.ca).

1:20,000 TRIM positional files from the Land and Resource Data Warehouse (http://lrdw.ca). Copyright belongs to Her Majesty the Queen in Right of the Province of British Columbia.

Disclaimer:
Maps presented in this document are a geographical representation of known features. Although the data collected and presented herein has been obtained with the utmost attention to quality, this document is not an official land survey and should not be considered for spatial calculation. EDI Environmental Dynamics Inc. does not accept any liability for errors, omissions or inaccuracies in the data.

APPENDIX A PORCUPINE RIVER SONAR DAILY COUNTS

Table A1. Daily Raw and Interpolated Sonar Counts at the Porcupine River sonar site in 2013.

Date	Left Bank	Left Bank Interpolated	Right Bank	Right Bank Interpolated	Both Banks	Both Banks Interpolated
24-Aug-13	132	132	0	0	132	132
25-Aug-13	270	270	0	0	270	270
27-Aug-13	236	236	0	0	236	236
28-Aug-13	290	296	53	53	343	349
29-Aug-13	338	338	185	185	523	523
30-Aug-13	387	387	180	194	567	581
31-Aug-13	455	455	273	273	728	728
01-Sep-13	535	535	248	275	783	810
02-Sep-13	376	499	262	282	638	781
03-Sep-13	487	531	398	404	885	935
04-Sep-13	387	402	287	315	674	717
05-Sep-13	481	481	181	194	662	675
06-Sep-13	553	553	223	223	776	776
07-Sep-13	588	602	153	153	741	755
08-Sep-13	618	618	115	143	733	761
09-Sep-13	496	496	123	123	619	619
10-Sep-13	511	511	123	123	634	634
11-Sep-13	528	528	108	108	636	636
12-Sep-13	435	556	0	107	435	663
13-Sep-13	503	503	0	97	503	600
14-Sep-13	706	706	0	136	706	842
15-Sep-13	866	866	0	166	866	1,032
16-Sep-13	920	920	0	177	920	1,097
17-Sep-13	1,270	1,285	0	247	1,270	1,532
18-Sep-13	1,075	1,087	0	209	1,075	1,296
19-Sep-13	1,269	1,269	0	244	1,269	1,513
20-Sep-13	1,135	1,202	0	231	1,135	1,433
21-Sep-13	1,078	1,078	105	106	1,183	1,184
22-Sep-13	1,024	1,024	113	113	1,137	1,137
23-Sep-13	866	886	98	98	984	984
24-Sep-13	868	868	96	96	964	964
25-Sep-13	821	821	122	122	943	943
26-Sep-13	786	786	65	77	851	863
27-Sep-13	732	732	83	83	815	815
28-Sep-13	725	725	0	85	725	810
29-Sep-13	577	577	19	67	596	644
30-Sep-13	572	572	65	65	637	637
01-Oct-13	434	434	90	90	524	524
02-Oct-13	387	427	107	117	494	544
03-Oct-13	341	390	114	116	455	506
04-Oct-13	339	375	108	108	447	483
05-Oct-13	364	364	135	135	499	499
06-Oct-13	294	294	142	148	436	442
07-Oct-13	268	268	70	148	338	416
08-Oct-13	250	250	110	121	360	371
09-Oct-13	218	229	130	164	348	393
10-Oct-13	241	241	161	161	402	402
11-Oct-13	213	213	84	149	297	362
12-Oct-13	194	211	0	0	211	211
Total Estimate	**27,892**	**28,595**	**4,942**	**7,031**	**32,834**	**35,626**

APPENDIX B PORCUPINE RIVER SONAR DRIFT NETTING EFFORT AND CAPTURES

Table B1. Drift netting effort and fish captures at the Porcupine River sonar site in 2013.

Date	Drift #	Net Location	Net In	Net Out	Mesh Size	Fish Species	Length (cm)	Sex	Tag Number	Notes
August 24, 2013	1	shore	15:39	15:45	5	None	None	None	None	
August 24, 2013	2	shore	15:48	15:54	5	None	None	None	None	
August 24, 2013	3	shore	16:00	16:06	5	None	None	None	None	
August 24, 2013	4	shore	16:09	16:15	5	None	None	None	None	
August 24, 2013	5	shore	16:24	16:30	5	None	None	None	None	
August 24, 2013	6	shore	16:36	16:42	5	CHUM	630	Female	02960	
August 24, 2013	7	shore	18:03	18:09	5	None	None	None	None	
August 24, 2013	8	shore	18:12	18:18	5	CHUM	630	Female	02960	Same Fish
August 24, 2013	9	shore	18:25	18:31	5	None	None	None	None	
August 24, 2013	10	shore	18:34	18:40	5	None	None	None	None	
August 24, 2013	11	shore	18:45	18:51	5	None	None	None	None	
August 24, 2013	12	shore	18:53	18:59	5	None	None	None	None	
August 24, 2013	13	shore	19:02	19:08	5	None	None	None	None	
August 24, 2013	14	shore	19:10	19:16	5	None	None	None	None	
August 25, 2013	1	shore	14:48	14:50	6	None	None	None	None	
August 25, 2013	2	shore	14:42	14:58	6	None	None	None	None	
August 25, 2013	3	shore	15:03	15:09	6	None	None	None	None	
August 25, 2013	4	shore	15:12	15:18	6	None	None	None	None	
August 25, 2013	5	shore	15:20	15:26	6	None	None	None	None	
August 25, 2013	6	shore	16:47	15:53	6	None	None	None	None	
August 25, 2013	7	shore	16:55	17:01	6	None	None	None	None	
August 25, 2013	8	shore	17:05	17:11	6	None	None	None	None	
August 25, 2013	9	shore	17:20	17:26	6	None	None	None	None	
August 25, 2013	10	shore	17:27	17:33	6	None	None	None	None	
August 25, 2013	11	shore	18:29	18:35	6	None	None	None	None	
August 25, 2013	12	shore	18:36	18:42	6	None	None	None	None	
August 25, 2013	13	shore	18:44	18:50	6	None	None	None	None	
August 25, 2013	14	shore	18:53	18:59	6	None	None	None	None	
August 26, 2013	1	shore	16:43	16:49	4.5	None	None	None	None	
August 26, 2013	2	shore	16:53	16:59	4.5	None	None	None	None	
August 26, 2013	3	shore	17:07	17:13	4.5	None	None	None	None	
August 26, 2013	4	shore	17:15	17:21	4.5	None	None	None	None	
August 26, 2013	5	shore	17:26	17:32	4.5	None	None	None	None	
August 26, 2013	6	shore	17:35	17:41	4.5	None	None	None	None	
August 26, 2013	7	shore	18:21	18:27	4.5	None	None	None	None	
August 26, 2013	8	shore	18:28	18:36	4.5	INCONNU	600	-	-	
August 26, 2013	9	shore	18:50	18:56	4.5	None	None	None	None	
August 26, 2013	10	shore	19:01	19:07	4.5	None	None	None	None	
August 26, 2013	11	shore	19:42	19:48	4.5	CHUM	680	Male	02958	
August 26, 2013	11	shore	19:42	19:48	4.5	CHUM	660	Male	02959	
August 27, 2013	1	shore	15:22	15:28	5	None	None	None	None	
August 27, 2013	2	shore	15:31	15:37	5	None	None	None	None	
August 27, 2013	3	shore	15:42	15:48	5	None	None	None	None	
August 27, 2013	4	shore	15:55	16:01	5	None	None	None	None	
August 27, 2013	5	shore	16:05	16:11	5	None	None	None	None	
August 27, 2013	6	shore	16:14	16:20	5	CHUM	660	Female	-	
August 27, 2013	7	shore	16:26	16:32	5	CHUM	690	Male	-	
August 27, 2013	7	shore	16:26	16:32	5	CHUM	680	Male	-	
August 27, 2013	8	shore	16:36	16:42	5	None	None	None	None	
August 27, 2013	9	shore	16:47	16:53	5	None	None	None	None	
August 27, 2013	10	shore	19:48	19:54	5	None	None	None	None	
August 27, 2013	11	shore	19:57	20:03	5	CHUM	730	Male	-	
August 27, 2013	12	shore	20:05	20:11	5	None	None	None	None	
August 27, 2013	13	shore	20:15	20:21	5	None	None	None	None	
August 27, 2013	14	shore	20:25	20:31	5	None	None	None	None	
August 28, 2013	1	shore	17:22	17:28	6	None	None	None	None	
August 28, 2013	2	shore	17:46	17:52	6	None	None	None	None	
August 28, 2013	3	shore	17:54	18:00	6	None	None	None	None	

Date	Drift #	Net Location	Net In	Net Out	Mesh Size	Fish Species	Length (cm)	Sex	Tag Number	Notes
August 28, 2013	4	shore	19:31	19:37	6	None	None	None	None	
August 28, 2013	5	shore	19:40	19:46	6	None	None	None	None	
August 28, 2013	6	shore	19:50	19:56	6	None	None	None	None	
August 29, 2013	1	shore	15:38	15:44	4.5	None	None	None	None	
August 29, 2013	2	shore	15:45	15:51	4.5	None	None	None	None	
August 29, 2013	3	shore	15:55	16:01	4.5	None	None	None	None	
August 29, 2013	4	shore	16:04	16:10	4.5	None	None	None	None	
August 29, 2013	5	shore	16:12	16:18	4.5	None	None	None	None	
August 29, 2013	6	shore	16:22	16:28	4.5	None	None	None	None	
August 29, 2013	7	shore	16:30	16:36	4.5	None	None	None	None	
August 29, 2013	8	shore	19:09	19:15	4.5	None	None	None	None	
August 29, 2013	9	shore	19:18	19:24	4.5	None	None	None	None	
August 29, 2013	10	shore	19:29	19:35	4.5	None	None	None	None	
August 29, 2013	11	shore	19:38	19:42	4.5	CHUM	630	Male	-	
August 29, 2013	12	shore	19:47	19:53	4.5	CHUM	650	Male	-	
August 29, 2013	12	shore	19:47	19:53	4.5	CHUM	700	Male	-	
August 29, 2013	13	shore	20:21	20:27	4.5	None	None	None	None	
August 29, 2013	14	shore	20:30	20:36	4.5	CHUM	780	Male	-	
August 30, 2013	1	shore	17:18	17:24	5	None	None	None	None	
August 30, 2013	2	shore	17:27	17:33	5	None	None	None	None	
August 30, 2013	3	shore	17:36	17:42	5	CHUM	680	Male	-	
August 30, 2013	3	shore	17:36	17:42	5	CHUM	700	Male	-	
August 30, 2013	4	shore	17:50	17:56	5	None	None	None	None	
August 30, 2013	5	shore	17:58	18:04	5	None	None	None	None	
August 30, 2013	6	shore	18:06	18:12	5	None	None	None	None	
August 30, 2013	7	shore	19:41	19:47	5	None	None	None	None	
August 30, 2013	8	shore	19:49	19:55	5	CHUM	630	Female	-	
August 30, 2013	9	shore	20:00	20:06	5	None	None	None	None	
August 30, 2013	10	shore	20:09	20:17	5	None	None	None	None	
August 30, 2013	11	shore	20:20	20:26	5	None	None	None	None	
August 30, 2013	12	shore	20:29	20:35	5	None	None	None	None	
August 31, 2013	1	shore	19:30	19:36	4.5	None	None	None	None	
August 31, 2013	2	shore	19:37	19:43	4.5	None	None	None	None	
August 31, 2013	3	shore	19:48	19:54	4.5	None	None	None	None	
August 31, 2013	4	shore	19:56	20:02	4.5	None	None	None	None	
August 31, 2013	5	shore	20:07	20:13	4.5	None	None	None	None	
August 31, 2013	6	shore	20:14	20:20	4.5	None	None	None	None	
August 31, 2013	7	shore	20:26	20:32	4.5	None	None	None	None	
August 31, 2013	8	shore	20:35	20:41	4.5	CHUM	680	Male	-	
September 1, 2013	1	shore	13:42	13:48	4.5	None	None	None	None	
September 1, 2013	2	shore	13:50	13:56	4.5	None	None	None	None	
September 1, 2013	3	shore	14:00	14:06	4.5	None	None	None	None	
September 1, 2013	4	shore	14:07	14:13	4.5	None	None	None	None	
September 1, 2013	5	shore	14:16	14:22	4.5	None	None	None	None	
September 1, 2013	6	shore	14:23	14:29	4.5	None	None	None	None	
September 1, 2013	7	shore	14:32	14:38	4.5	None	None	None	None	
September 1, 2013	8	shore	14:39	14:45	4.5	None	None	None	None	
September 1, 2013	9	shore	15:00	15:12	4.5	None	None	None	None	
September 1, 2013	10	shore	15:14	15:20	4.5	CHUM	640	Female	-	
September 1, 2013	11	shore	15:23	15:29	4.5	None	None	None	None	
September 1, 2013	12	shore	15:29	15:35	4.5	None	None	None	None	
September 1, 2013	13	shore	15:37	15:47	4.5	None	None	None	None	
September 1, 2013	14	shore	15:44	15:50	4.5	None	None	None	None	
September 2, 2013	1	shore	13:05	13:11	6	None	None	None	None	
September 2, 2013	2	shore	13:17	13:23	6	None	None	None	None	
September 2, 2013	3	shore	13:25	13:31	6	None	None	None	None	
September 2, 2013	4	shore	13:36	13:42	6	None	None	None	None	
September 2, 2013	5	shore	13:45	13:51	6	None	None	None	None	
September 2, 2013	6	shore	13:56	14:02	6	None	None	None	None	
September 2, 2013	7	shore	14:04	14:10	6	None	None	None	None	
September 2, 2013	8	shore	15:42	15:48	6	None	None	None	None	
September 2, 2013	9	shore	15:50	15:56	6	None	None	None	None	
September 2, 2013	10	shore	16:02	16:08	6	None	None	None	None	

Date	Drift #	Net Location	Net In	Net Out	Mesh Size	Fish Species	Length (cm)	Sex	Tag Number	Notes
September 2, 2013	11	shore	16:11	16:17	6	None	None	None	None	
September 2, 2013	12	shore	16:23	16:29	6	None	None	None	None	
September 2, 2013	13	shore	16:31	16:37	6	None	None	None	None	
September 2, 2013	14	shore	13:05	13:11	6	None	None	None	None	
September 3, 2013	1	Near LDB	11:56	12:02	5	None	None	None	None	
September 3, 2013	2	Near LDB	12:06	12:12	5	CHUM	770	Male	02951	
September 3, 2013	3	Near LDB	12:16	12:26	5	None	None	None	None	
September 3, 2013	4	Near LDB	12:36	12:46	5	CHUM	620	Female	02954	
September 3, 2013	5	Near LDB	13:56	14:02	5	None	None	None	None	
September 3, 2013	6	Near LDB	14:05	14:11	5	None	None	None	None	
September 3, 2013	7	Near LDB	14:18	14:24	5	None	None	None	None	
September 3, 2013	8	Near LDB	14:27	14:33	5	None	None	None	None	
September 3, 2013	9	Near LDB	14:39	14:46	5	None	None	None	None	
September 3, 2013	10	Near LDB	14:48	14:54	5	None	None	None	None	
September 3, 2013	11	Near LDB	16:38	16:44	5	CHUM	760	Male	02953	
September 3, 2013	11	Near LDB	16:38	16:44	5	CHUM	780	Male	02952	
September 3, 2013	12	Near LDB	17:02	17:08	5	CHUM	785	Male	02951	
September 3, 2013	13	Near LDB	17:18	17:24	5	None	None	None	None	
September 3, 2013	14	Near LDB	17:26	17:32	5	None	None	None	None	
September 4, 2013	1	Near LDB	19:53	19:59	4.5	CHUM	720	Male	02947	
September 4, 2013	2	Near LDB	20:06	20:12	4.5	None	None	None	None	
September 4, 2013	3	Near LDB	20:16	20:22	4.5	None	None	None	None	
September 4, 2013	4	Near LDB	20:25	20:31	4.5	None	None	None	None	
September 4, 2013	5	Near LDB	20:35	20:41	4.5	None	None	None	None	
September 4, 2013	6	Near LDB	20:44	20:50	4.5	None	None	None	None	
September 4, 2013	7	Near LDB	20:54	21:00	4.5	None	None	None	None	
September 4, 2013	8	Near LDB	21:02	21:08	4.5	None	None	None	None	
September 4, 2013	9	Near LDB	21:47	21:53	4.5	None	None	None	None	
September 4, 2013	10	Near LDB	21:55	22:01	4.5	None	None	None	None	
September 4, 2013	11	Near LDB	22:06	22:12	4.5	None	None	None	None	
September 4, 2013	12	Near LDB	22:15	20:21	4.5	None	None	None	None	
September 4, 2013	13	Near LDB	22:25	22:31	4.5	None	None	None	None	
September 4, 2013	14	Near LDB	22:34	22:40	4.5	None	None	None	None	
September 5, 2013	1	Near LDB	10:58	11:04	6	None	None	None	None	
September 5, 2013	2	Near LDB	11:07	11:13	6	None	None	None	None	
September 5, 2013	3	Near LDB	11:22	11:28	6	None	None	None	None	
September 5, 2013	4	Near LDB	11:31	11:37	6	None	None	None	None	
September 5, 2013	5	Near LDB	11:41	11:47	6	None	None	None	None	
September 5, 2013	6	Near LDB	11:51	11:57	6	None	None	None	None	
September 5, 2013	7	Near LDB	12:00	12:06	6	None	None	None	None	
September 5, 2013	8	Near LDB	20:59	21:05	6	None	None	None	None	
September 5, 2013	9	Near LDB	21:07	21:13	6	None	None	None	None	
September 5, 2013	10	Near LDB	21:27	21:33	6	None	None	None	None	
September 5, 2013	11	Near LDB	21:35	21:41	6	None	None	None	None	
September 5, 2013	12	Near LDB	21:44	21:50	6	None	None	None	None	
September 5, 2013	13	Near LDB	21:50	21:56	6	None	None	None	None	
September 5, 2013	14	Near LDB	22:02	22:08	6	None	None	None	None	
September 6, 2013	1	Near LDB	15:47	15:51	5	None	None	None	None	
September 6, 2013	2	Near RDB	15:54	16:00	5	None	None	None	None	
September 6, 2013	3	OFF LDB	16:06	16:12	5	None	None	None	None	
September 6, 2013	4	Near LDB	16:17	16:23	5	None	None	None	None	
September 6, 2013	5	Off LDB	16:30	16:36	5	None	None	None	None	
September 6, 2013	6	Near LDB	16:39	16:45	5	None	None	None	None	
September 6, 2013	7	Off LDB	16:50	16:56	5	None	None	None	None	
September 6, 2013	8	Near LDB	17:00	17:06	5	None	None	None	None	
September 6, 2013	9	Off LDB	17:13	17:19	5	None	None	None	None	
September 6, 2013	10	Near LDB	17:22	17:28	5	None	None	None	None	
September 6, 2013	11	Near LDB	17:36	17:42	5	None	None	None	None	
September 6, 2013	12	Near LDB	17:46	17:52	5	None	None	None	None	
September 6, 2013	13	Near LDB	17:58	18:04	5	None	None	None	None	
September 6, 2013	14	Near LDB	18:07	18:13	5	None	None	None	None	
September 7, 2013	1	Near LDB	13:12	13:18	4.5	None	None	None	None	

Date	Drift #	Net Location	Net In	Net Out	Mesh Size	Fish Species	Length (cm)	Sex	Tag Number	Notes
September 7, 2013	2	Near LDB	13:20	13:26	4.5	None	None	None	None	
September 7, 2013	3	Near LDB	13:32	13:38	4.5	None	None	None	None	
September 7, 2013	4	Near LDB	13:41	13:47	4.5	None	None	None	None	
September 7, 2013	5	Near LDB	13:51	13:58	4.5	CHUM	660	Male	02930	
September 7, 2013	6	Near LDB	14:01	14:07	4.5	None	None	None	None	
September 7, 2013	7	Near LDB	14:34	14:40	4.5	None	None	None	None	
September 7, 2013	8	Near LDB	14:43	14:49	4.5	None	None	None	None	
September 7, 2013	9	Near LDB	14:53	14:59	4.5	None	None	None	None	
September 7, 2013	10	Near LDB	15:03	15:09	4.5	None	None	None	None	
September 7, 2013	11	Near LDB	16:24	16:30	4.5	None	None	None	None	
September 7, 2013	12	Near LDB	16:32	16:38	4.5	CHUM	580	Female	-	
September 7, 2013	13	Near LDB	16:50	16:56	4.5	None	None	None	None	
September 7, 2013	14	Near LDB	16:59	17:05	4.5	None	None	None	None	
September 9, 2013	1	Near LDB	16:46	16:52	6	None	None	None	None	
September 9, 2013	2	Near LDB	17:00	17:06	6	None	None	None	None	
September 9, 2013	3	Near LDB	17:12	17:18	6	None	None	None	None	
September 9, 2013	4	Near LDB	17:21	17:27	6	None	None	None	None	
September 9, 2013	5	Near LDB	17:34	17:40	6	None	None	None	None	
September 9, 2013	6	Near LDB	17:43	17:49	6	None	None	None	None	
September 9, 2013	7	Near LDB	17:53	17:59	6	None	None	None	None	
September 9, 2013	8	Near LDB	18:04	18:10	6	None	None	None	None	
September 9, 2013	9	Near LDB	18:16	18:22	6	None	None	None	None	
September 9, 2013	10	Near LDB	18:26	18:32	6	None	None	None	None	
September 9, 2013	11	Near LDB	18:50	18:56	6	None	None	None	None	
September 9, 2013	12	Near LDB	19:02	19:08	6	None	None	None	None	
September 9, 2013	13	Near LDB	19:13	19:19	6	None	None	None	None	
September 9, 2013	14	Near LDB	19:23	19:29	6	None	None	None	None	
September 10, 2013	1	Near LDB	14:04	14:10	5	None	None	None	None	
September 10, 2013	2	Near LDB	14:15	14:21	5	None	None	None	None	
September 10, 2013	3	Near LDB	14:24	14:30	5	None	None	None	None	
September 10, 2013	4	Near LDB	14:35	14:41	5	None	None	None	None	
September 10, 2013	5	Near LDB	14:53	14:59	5	None	None	None	None	
September 10, 2013	6	Near LDB	15:02	15:08	5	None	None	None	None	
September 10, 2013	7	Near LDB	15:10	15:16	5	None	None	None	None	
September 10, 2013	8	Near LDB	18:31	18:37	5	None	None	None	None	
September 10, 2013	9	Near LDB	18:42	18:48	5	CHUM	650	Male	02917	
September 10, 2013	10	Near LDB	19:00	19:06	5	None	None	None	None	
September 10, 2013	11	Near LDB	19:08	19:14	5	CHUM	740	Male	02916	
September 10, 2013	12	Near LDB	19:17	19:23	5	None	None	None	None	
September 10, 2013	13	Near LDB	19:26	19:32	5	None	None	None	None	
September 10, 2013	14	Near LDB	19:35	19:41	5	None	None	None	None	
September 11, 2013	1	Near LDB	17:49	17:55	4.5	None	None	None	None	
September 11, 2013	2	Near LDB	17:57	18:03	4.5	None	None	None	None	
September 11, 2013	3	Near LDB	18:06	18:12	4.5	None	None	None	None	
September 11, 2013	4	Near LDB	18:15	18:21	4.5	None	None	None	None	
September 11, 2013	5	Near LDB	18:23	18:29	4.5	None	None	None	None	
September 11, 2013	6	Near LDB	18:30	18:36	4.5	None	None	None	None	
September 11, 2013	7	Near LDB	18:50	18:56	4.5	None	None	None	None	
September 11, 2013	8	Near LDB	18:58	19:04	4.5	None	None	None	None	
September 11, 2013	9	Near LDB	19:06	19:12	4.5	None	None	None	None	
September 11, 2013	10	Near LDB	19:15	19:21	4.5	None	None	None	None	
September 11, 2013	11	Near LDB	19:24	19:30	4.5	None	None	None	None	
September 11, 2013	12	Near LDB	19:33	19:39	4.5	None	None	None	None	
September 11, 2013	13	Near LDB	19:42	19:48	4.5	None	None	None	None	
September 11, 2013	14	Near LDB	19:50	19:56	4.5	None	None	None	None	
September 12, 2013	1	Near LDB	14:49	14:55	6	None	None	None	None	
September 12, 2013	2	Near LDB	14:58	15:04	6	CHUM	700	Male	02915	
September 12, 2013	3	Near LDB	15:10	15:16	6	None	None	None	None	
September 12, 2013	4	Near LDB	15:20	15:26	6	None	None	None	None	
September 12, 2013	5	Near LDB	15:28	15:34	6	None	None	None	None	
September 12, 2013	6	Near LDB	15:36	15:42	6	CHUM	720	Male	02914	
September 12, 2013	6	Near LDB	15:36	15:42	6	CHUM	740	Male	02913	
September 12, 2013	7	Near LDB	15:46	15:52	6	None	None	None	None	

Date	Drift #	Net Location	Net In	Net Out	Mesh Size	Fish Species	Length (cm)	Sex	Tag Number	Notes
September 12, 2013	8	Near LDB	17:40	17:46	6	None	None	None	None	
September 12, 2013	9	Near LDB	18:49	18:55	6	None	None	None	None	
September 12, 2013	10	Near LDB	18:58	19:04	6	None	None	None	None	
September 12, 2013	11	Near LDB	19:08	19:14	6	None	None	None	None	
September 12, 2013	12	Near LDB	19:17	19:23	6	None	None	None	None	
September 12, 2013	13	Near LDB	19:25	19:31	6	None	None	None	None	
September 12, 2013	14	Near LDB	19:33	19:39	6	None	None	None	None	
September 16, 2013	1	Near LDB	18:16	18:22	5	None	None	None	None	
September 16, 2013	2	Near LDB	19:02	19:08	5	None	None	None	None	
September 16, 2013	3	Near LDB	19:11	19:17	5	None	None	None	None	
September 16, 2013	4	Near LDB	19:23	19:29	5	None	None	None	None	
September 16, 2013	5	Near LDB	19:37	19:43	5	None	None	None	None	
September 16, 2013	6	Near LDB	19:56	20:02	5	None	None	None	None	
September 16, 2013	7	Near LDB	20:08	20:14	5	None	None	None	None	
September 16, 2013	8	Near LDB	20:18	20:24	5	CHUM	650	Male	02912	
September 16, 2013	9	Near LDB	20:39	20:45	5	None	None	None	None	
September 16, 2013	10	Near LDB	20:49	20:55	5	None	None	None	None	
September 16, 2013	11	Near LDB	20:59	21:05	5	None	None	None	None	
September 16, 2013	12	Near LDB	21:07	21:13	5	CHUM	-	Female	02911	
September 16, 2013	13	Near LDB	21:27	21:33	5	CHUM	680	Male	02910	
September 16, 2013	14	Near LDB	21:47	21:53	5	None	None	None	None	
September 17, 2013	1	Near LDB	13:59	14:05	4.5	None	None	None	None	
September 17, 2013	2	Near LDB	14:08	14:14	4.5	CHUM	680	Male	02909	
September 17, 2013	3	Near LDB	14:28	14:34	4.5	None	None	None	None	
September 17, 2013	4	Near LDB	14:37	14:43	4.5	None	None	None	None	
September 17, 2013	5	Near LDB	14:47	14:53	4.5	None	None	None	None	
September 17, 2013	6	Near LDB	14:57	15:03	4.5	CHUM	760	Male	02908	
September 17, 2013	7	Near LDB	15:13	15:19	4.5	CHUM	710	Female	02907	
September 17, 2013	8	Near LDB	15:29	15:35	4.5	None	None	None	None	
September 17, 2013	9	Near LDB	15:40	15:46	4.5	CHUM	610	Female	02905	
September 17, 2013	10	Near LDB	15:56	16:02	4.5	None	None	None	None	
September 17, 2013	11	Near LDB	16:07	16:13	4.5	None	None	None	None	
September 17, 2013	12	Near LDB	16:16	16:22	4.5	None	None	None	None	
September 17, 2013	13	Near LDB	16:27	16:33	4.5	None	None	None	None	
September 17, 2013	14	Near LDB	16:35	16:41	4.5	None	None	None	None	
September 18, 2013	1	Near LDB	20:42	20:48	6	None	None	None	None	
September 18, 2013	2	Near LDB	20:54	21:00	6	CHUM	665	Male	-	
September 18, 2013	3	Near LDB	21:09	21:15	6	None	None	None	None	
September 18, 2013	4	Near LDB	21:18	21:24	6	CHUM	630	Female	-	
September 18, 2013	5	Near LDB	21:32	21:38	6	None	None	None	None	
September 18, 2013	6	Near LDB	21:42	21:48	6	None	None	None	None	
September 18, 2013	7	Near LDB	21:51	21:57	6	None	None	None	None	
September 19, 2013	1	Near LDB	15:04	15:10	5	None	None	None	None	
September 19, 2013	2	Near LDB	15:17	15:23	5	None	None	None	None	
September 19, 2013	3	Near LDB	15:28	15:34	5	None	None	None	None	
September 19, 2013	4	Near LDB	15:36	15:42	5	None	None	None	None	
September 19, 2013	5	Near LDB	15:46	15:52	5	None	None	None	None	
September 19, 2013	6	Near LDB	15:56	16:02	5	None	None	None	None	
September 19, 2013	7	Near LDB	16:06	16:12	5	None	None	None	None	
September 19, 2013	8	Near LDB	16:15	16:21	5	None	None	None	None	
September 19, 2013	9	Near LDB	16:25	16:31	5	None	None	None	None	
September 19, 2013	10	Near LDB	16:34	16:40	5	None	None	None	None	
September 19, 2013	11	Near LDB	16:44	16:50	5	None	None	None	None	
September 19, 2013	12	Near LDB	16:53	16:59	5	None	None	None	None	
September 19, 2013	13	Near LDB	17:05	17:11	5	None	None	None	None	
September 19, 2013	14	Near LDB	17:14	17:20	5	None	None	None	None	
September 21, 2013	1	Near LDB	18:12	18:18	4.5	None	None	None	None	
September 21, 2013	2	Near LDB	18:23	18:29	4.5	None	None	None	None	
September 21, 2013	3	Near LDB	18:33	18:39	4.5	None	None	None	None	
September 21, 2013	4	Near LDB	18:42	18:48	4.5	None	None	None	None	
September 21, 2013	5	Near LDB	18:53	18:59	4.5	None	None	None	None	
September 21, 2013	6	Near LDB	19:02	19:08	4.5	None	None	None	None	
September 21, 2013	7	Near LDB	19:13	19:19	4.5	CHUM	695	Male	-	

Date	Drift #	Net Location	Net In	Net Out	Mesh Size	Fish Species	Length (cm)	Sex	Tag Number	Notes
September 21, 2013	8	Near LDB	19:27	19:33	4.5	None	None	None	None	
September 21, 2013	9	Near LDB	19:40	19:46	4.5	None	None	None	None	
September 21, 2013	10	Near LDB	19:51	19:57	4.5	None	None	None	None	
September 21, 2013	11	Near LDB	20:01	20:07	4.5	None	None	None	None	
September 21, 2013	12	Near LDB	20:11	20:17	4.5	None	None	None	None	
September 21, 2013	13	Near LDB	20:22	20:28	4.5	None	None	None	None	
September 21, 2013	14	Near LDB	20:32	20:38	4.5	None	None	None	None	
September 22, 2013	1	Near LDB	12:34	12:40	6	None	None	None	None	
September 22, 2013	2	Near LDB	12:45	12:51	6	None	None	None	None	
September 22, 2013	3	Near LDB	12:56	13:02	6	None	None	None	None	
September 22, 2013	4	Near LDB	13:06	13:12	6	None	None	None	None	
September 22, 2013	5	Near LDB	13:55	14:01	6	CHUM	695	Male	02904	
September 22, 2013	6	Near LDB	14:21	14:27	6	None	None	None	None	
September 22, 2013	7	Near LDB	14:47	14:53	6	CHUM	690	Male	02903	
September 22, 2013	8	Near LDB	14:12	14:18	6	None	None	None	None	
September 22, 2013	9	Near LDB	19:48	19:54	6	None	None	None	None	
September 22, 2013	10	Near LDB	19:57	20:03	6	None	None	None	None	
September 22, 2013	11	Near LDB	20:09	20:15	6	None	None	None	None	
September 22, 2013	12	Near LDB	20:18	20:24	6	None	None	None	None	
September 22, 2013	13	Near LDB	20:39	20:45	6	None	None	None	None	
September 22, 2013	14	Near LDB	20:39	20:45	6	None	None	None	None	
September 23, 2013	1	Near LDB	12:14	12:20	5	None	None	None	None	
September 23, 2013	2	Near LDB	12:26	12:32	5	None	None	None	None	
September 23, 2013	3	Near LDB	12:49	12:55	5	None	None	None	None	
September 23, 2013	4	Near LDB	12:59	13:05	5	None	None	None	None	
September 23, 2013	5	Near LDB	13:10	13:16	5	None	None	None	None	
September 23, 2013	6	Near LDB	13:20	13:26	5	None	None	None	None	
September 23, 2013	7	Near LDB	13:55	14:01	5	None	None	None	None	
September 23, 2013	8	Near LDB	14:06	14:01	5	None	None	None	None	
September 23, 2013	9	Near LDB	14:18	14:24	5	None	None	None	None	
September 23, 2013	10	Near LDB	14:28	14:34	5	None	None	None	None	
September 23, 2013	11	Near LDB	17:37	17:43	5	None	None	None	None	
September 23, 2013	12	Near LDB	17:46	17:52	5	None	None	None	None	
September 23, 2013	13	Near LDB	18:22	18:28	5	None	None	None	None	
September 23, 2013	14	Near LDB	18:31	18:37	5	None	None	None	None	
September 24, 2013	1	Near LDB	12:20	12:26	4.5	None	None	None	None	
September 24, 2013	2	Near LDB	12:28	12:34	4.5	None	None	None	None	
September 24, 2013	3	Near LDB	12:39	12:45	4.5	None	None	None	None	
September 24, 2013	4	Near LDB	12:48	12:54	4.5	CHUM	615	Female	02902	
September 24, 2013	5	Near LDB	13:59	14:05	4.5	None	None	None	None	
September 24, 2013	6	Near LDB	15:20	15:26	4.5	None	None	None	None	
September 24, 2013	7	Near LDB	15:30	15:36	4.5	None	None	None	None	
September 24, 2013	8	Near LDB	15:40	15:46	4.5	None	None	None	None	
September 24, 2013	9	Near LDB	15:48	15:54	4.5	None	None	None	None	
September 24, 2013	10	Near LDB	15:58	16:04	4.5	None	None	None	None	
September 24, 2013	11	Near LDB	19:21	19:27	4.5	None	None	None	None	
September 24, 2013	12	Near LDB	19:29	19:35	4.5	None	None	None	None	
September 24, 2013	13	Near LDB	19:39	19:45	4.5	CHUM	725	Male	02890	
September 24, 2013	14	Near LDB	19:58	20:04	4.5	None	None	None	None	
September 25, 2013	1	Near LDB	13:22	13:28	6	None	None	None	None	
September 25, 2013	2	Near LDB	13:31	13:37	6	None	None	None	None	
September 25, 2013	3	Near LDB	13:46	13:52	6	None	None	None	None	
September 25, 2013	4	Near LDB	15:38	15:44	6	None	None	None	None	
September 25, 2013	5	Near LDB	15:48	15:54	6	None	None	None	None	
September 25, 2013	6	Near LDB	16:00	16:06	6	None	None	None	None	
September 25, 2013	7	Near LDB	16:10	16:16	6	None	None	None	None	
September 25, 2013	8	Near LDB	16:20	16:20	6	CHUM	650	Male	-	
September 25, 2013	8	Near LDB	16:20	16:20	6	CHUM	695	Male	02881	
September 25, 2013	8	Near LDB	16:20	16:20	6	CHUM	640	Female	-	
September 25, 2013	9	Near LDB	16:43	16:49	6	None	None	None	None	
September 25, 2013	10	Near LDB	17:03	17:09	6	None	None	None	None	
September 25, 2013	11	Near LDB	17:12	17:18	6	None	None	None	None	
September 25, 2013	12	Near LDB	17:22	17:28	6	None	None	None	None	

Date	Drift #	Net Location	Net In	Net Out	Mesh Size	Fish Species	Length (cm)	Sex	Tag Number	Notes
September 25, 2013	13	Near LDB	17:31	17:37	6	None	None	None	None	
September 25, 2013	14	Near LDB	17:41	17:47	6	None	None	None	None	
September 25, 2013	15	Near LDB	17:49	17:55	6	CHUM	690	Male	-	
September 25, 2013	15	Near LDB	17:49	17:55	6	CHUM	690	Male	-	Same Fish
September 26, 2013	1	Near LDB	14:26	14:32	5	None	None	None	None	
September 26, 2013	2	Near LDB	14:36	14:42	5	None	None	None	None	
September 26, 2013	3	Near LDB	14:49	14:55	5	None	None	None	None	
September 26, 2013	4	Near LDB	15:00	15:06	5	None	None	None	None	
September 26, 2013	5	Near LDB	15:11	15:17	5	None	None	None	None	
September 26, 2013	6	Near LDB	15:21	15:27	5	None	None	None	None	
September 26, 2013	7	Near LDB	15:32	15:38	5	None	None	None	None	
September 26, 2013	8	Near LDB	15:41	15:47	5	None	None	None	None	
September 26, 2013	9	Near LDB	15:51	15:57	5	None	None	None	None	
September 26, 2013	10	Near LDB	16:00	16:06	5	None	None	None	None	
September 26, 2013	11	Off LDB	16:27	16:33	5	None	None	None	None	
September 26, 2013	12	Near LDB	16:38	16:44	5	None	None	None	None	
September 26, 2013	13	Near LDB	16:50	16:56	5	None	None	None	None	
September 26, 2013	14	Near LDB	17:00	17:06	5	None	None	None	None	
September 27, 2013	1	Near LDB	15:23	15:29	4.5	None	None	None	None	
September 27, 2013	2	Near LDB	15:32	15:38	4.5	None	None	None	None	
September 27, 2013	3	Near LDB	15:41	15:47	4.5	CHUM	610	Female	-	
September 27, 2013	4	Near LDB	15:52	15:58	4.5	None	None	None	None	
September 27, 2013	5	Near LDB	16:03	16:09	4.5	None	None	None	None	
September 27, 2013	6	Near LDB	16:14	16:20	4.5	None	None	None	None	
September 27, 2013	7	Near LDB	16:26	16:32	4.5	None	None	None	None	
September 27, 2013	8	Near LDB	16:35	16:41	4.5	None	None	None	None	
September 27, 2013	9	Near LDB	16:45	16:51	4.5	None	None	None	None	
September 27, 2013	10	Near LDB	16:55	17:01	4.5	None	None	None	None	
September 27, 2013	11	Near LDB	17:05	17:11	4.5	None	None	None	None	
September 28, 2013	1	Near LDB	17:51	17:57	6	None	None	None	None	
September 28, 2013	2	Near LDB	18:01	18:07	6	None	None	None	None	
September 28, 2013	3	Near LDB	18:13	18:19	6	None	None	None	None	
September 28, 2013	4	Near LDB	18:23	18:29	6	CHUM	615	Female	02866	
September 28, 2013	5	Near LDB	18:48	18:54	6	None	None	None	None	
September 28, 2013	6	Near LDB	18:58	19:04	6	None	None	None	None	
September 28, 2013	7	Near LDB	19:11	19:17	6	None	None	None	None	
September 28, 2013	8	Near LDB	19:22	19:28	6	None	None	None	None	
September 28, 2013	9	Near LDB	19:34	19:40	6	CHUM	695	Male	-	
September 28, 2013	10	Near LDB	19:46	19:52	6	None	None	None	None	
September 28, 2013	11	Near LDB	19:57	20:03	6	None	None	None	None	
September 28, 2013	12	Near LDB	20:07	20:13	6	None	None	None	None	
September 28, 2013	13	Near LDB	20:19	20:25	6	None	None	None	None	
September 28, 2013	14	Near LDB	20:30	20:36	6	None	None	None	None	
October 2, 2013	1	Near LDB	18:00	18:06	4.5	None	None	None	None	
October 2, 2013	2	Near LDB	18:08	18:14	4.5	None	None	None	None	
October 2, 2013	3	Near LDB	18:18	18:24	4.5	None	None	None	None	
October 2, 2013	4	Near LDB	18:28	18:34	4.5	None	None	None	None	
October 2, 2013	5	Near LDB	18:39	18:45	4.5	None	None	None	None	
October 2, 2013	6	Near LDB	18:48	18:54	4.5	None	None	None	None	
October 2, 2013	7	Near LDB	18:57	19:03	4.5	None	None	None	None	
October 2, 2013	8	Near LDB	19:07	19:13	4.5	None	None	None	None	
October 2, 2013	9	Near LDB	19:17	19:23	4.5	None	None	None	None	
October 2, 2013	10	Near LDB	19:26	19:32	4.5	None	None	None	None	
October 3, 2013	1	Near LDB	18:32	18:38	5	None	None	None	None	
October 3, 2013	2	Near LDB	18:41	18:47	5	None	None	None	None	
October 3, 2013	3	Near LDB	18:50	18:56	5	None	None	None	None	
October 3, 2013	4	Near LDB	18:59	19:05	5	None	None	None	None	
October 3, 2013	5	Near LDB	19:08	19:14	5	None	None	None	None	
October 3, 2013	6	Near LDB	19:16	19:22	5	None	None	None	None	
October 3, 2013	7	Near LDB	19:26	19:32	5	None	None	None	None	
October 3, 2013	8	Near LDB	19:35	19:41	5	None	None	None	None	
October 3, 2013	9	Near LDB	19:44	19:50	5	None	None	None	None	

Date	Drift #	Net Location	Net In	Net Out	Mesh Size	Fish Species	Length (cm)	Sex	Tag Number	Notes
October 3, 2013	10	Near LDB	19:53	19:59	5	None	None	None	None	
October 3, 2013	11	Near LDB	20:02	20:08	5	None	None	None	None	
October 3, 2013	12	Near LDB	20:12	20:18	5	None	None	None	None	
October 3, 2013	13	Near LDB	20:23	20:29	5	None	None	None	None	
October 3, 2013	14	Near LDB	20:32	20:38	5	None	None	None	None	
October 5, 2013	1	Near LDB	16:22	16:28	6	None	None	None	None	
October 5, 2013	2	Near LDB	16:32	16:38	6	None	None	None	None	
October 5, 2013	3	Near LDB	16:42	16:48	6	None	None	None	None	
October 5, 2013	4	Near LDB	16:53	16:59	6	None	None	None	None	
October 5, 2013	5	Near LDB	17:03	17:09	6	None	None	None	None	
October 5, 2013	6	Near LDB	17:12	17:18	6	None	None	None	None	
October 5, 2013	7	Near LDB	17:21	17:27	6	None	None	None	None	
October 5, 2013	8	Near LDB	17:31	17:37	6	None	None	None	None	
October 5, 2013	9	Near LDB	17:40	17:46	6	None	None	None	None	
October 5, 2013	10	Near LDB	17:50	17:56	6	None	None	None	None	
October 5, 2013	11	Near LDB	17:59	18:05	6	None	None	None	None	
October 5, 2013	12	Near LDB	18:08	18:14	6	None	None	None	None	
October 5, 2013	13	Near LDB	18:17	18:23	6	None	None	None	None	
October 5, 2013	14	Near LDB	18:27	18:33	6	None	None	None	None	
October 7, 2013	1	Near LDB	18:42	18:48	4.5	None	None	None	None	
October 7, 2013	2	Near LDB	18:51	18:57	4.5	None	None	None	None	
October 7, 2013	3	Near LDB	19:01	19:07	4.5	None	None	None	None	
October 7, 2013	4	Near LDB	19:10	19:16	4.5	None	None	None	None	
October 7, 2013	5	Near LDB	19:20	19:26	4.5	None	None	None	None	
October 7, 2013	6	Near LDB	19:30	19:36	4.5	None	None	None	None	
October 7, 2013	7	Near LDB	19:39	19:45	4.5	None	None	None	None	

LDB = Left Downstream Bank