# JUVENILE COHO POPULATION ESTIMATES IN THE TELKWA RIVER PONDS MAY 1994

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Prepared by

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for

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## **1.0 INTRODUCTION**

The Department of Fisheries and Oceans (Resource Restoration Section) has undertaken a project to improve juvenile fish access into a series of ponds adjacent the Telkwa River. Two special "caged box inlet" structures (one with an outlet cage) were installed during the summer of 1993 at a location that has been routinely blocked by beavers in the past (Figure 1). An additional culvert was installed at the outlet of the upper pond. This upper culvert was protected by approximately 25 m of fencing above and below the culvert. As well, floating logs were placed at the top end of the culvert to inhibit beaver dam construction.

Additional enhancement work undertaken included the excavation of a channel connecting the upper and lower ponds (half with debris and half with rock placements) and the development of three channels connected to the upper pond collecting seepage water evident during preliminary surveys. Debris was placed in one of these channels (Channel 2). No cover was added to Channel 1 and existing natural cover was left in Channel 3.

As part of this program, David Bustard and Associates was asked to conduct population estimates in the ponds to determine the abundance and distribution of fish. This report summarizes the results of the fish sampling program for 1994. Fish population estimates conducted prior to the development work are reported in Bustard (1993).

# 2.0 METHODS

Mark-and-recapture estimates were conducted in the Telkwa ponds during mid-May (May 17 to May 22, 1994) just prior to the main period of smolt outmigration. The ponds were separated into seven sections (Figure 1) and 64 minnow traps baited with roe were set overnight throughout the ponds during the initial marking period as delineated in Table 1. The same number of traps were used for the recapture three days later.

All fish captured during the May 17/18 surveys were marked with a lower caudal clip, measured to the nearest mm fork length, and released at the point of capture. A recapture was undertaken three days later. The same number of traps were used in each section for the recapture. All fish were measured and examined for marks prior to release.

Table 1. Location and Number o Telkwa Ponds during M	f Minnow Traps Set in the ay 1994.
LOCATION	NUMBER OF TRAPS <sup>1</sup>
Lower Pond	15
Connecting Creek - Debris	5
Connecting Creek - Rock	5
Upper Pond	10
Channel 1	10
Channel 2	10
Channel 3	9
TOTAL	64

Population estimates were conducted using the Chapman modification of the Petersen formula (Chapman 1951) and the 95% confidence intervals were calculated using the standard error of the estimate (Robson and Regier 1971). The estimates were separated by pond section and by coho less than or larger than 75 mm fork length. Visual observations suggested that many of the coho larger than this size were probably going to smolt in the near future.

The outlet of the culvert was blocked with a fine-mesh screen on the first day of the surveys to prevent fish movements in or out of the study area during the estimates. It should be noted that fish freely move between sections during the study, and although estimates were done by section, the combined estimate is probably more appropriate for estimating the total numbers of fish.

Water temperatures and dissolved oxygen levels (YSI Dissolved Oxygen Meter) were measured at 0.5 m depth intervals in each of the ponded sections. As well measurements of TDS (total dissolved solids) were recorded.

<sup>&</sup>lt;sup>1</sup> Note - the same approximate distribution and numbers of traps were used in the recapture.



Figure 1. Approximate Configuration of Ponds at Km 11 on Telkwa River Forest Road, May 1994

### **3.0 RESULTS**

#### 3.1 Access

The mid-May sampling was undertaken during a period when the mainstem Telkwa River was in freshet from snowmelt in the upper watershed. There was no access difficulty for fry moving from the mainstem Telkwa River to the culverts at these flows. It was noted that Culvert #2 (60 cm diameter without screening on the outlet) was blocked by a beaver dam midway through the culvert and appeared to be impassable to fish. The wire "box" inlets on both culverts apppear to be effective in deterring beavers from blocking the inlets to the culverts. The outlet mesh on the smaller Culvert #1 (40 cm diameter) was intact, and it is assumed this is the main entrance and exit route for fish using the ponds. This culvert was entirely submerged.

Newly-emerged coho fry (30-35 mm fork length range) were observed in the stream channel immediately below the culvert and presumably are entering the ponds during this period. These fish are too small to be captured in minnow traps (<45mm) and do not appear in the fish sampling results. It was noted that the numbers of newlyemerged coho increased in the outlet stream during the period May 17 to May 22. Yearling-sized coho were also present at the culvert outlet.

No dams were evident in the channel between the upper and lower ponds. Water was flowing over the culvert (estimate 1-2 cfs) at this location. The culvert itself may have been placed too low in the creek. There was evidence of fresh beaver cuttings throughout the channels and a beaver was observed in the lower pond during the sampling.

#### 3.2 Water Quality

The results of the dissolved oxygen and water temperature sampling are presented in Table 1. Water temperatures in the pond areas were 7-15°C compared to 6.5°C in the mainstem Telkwa River. Temperatures in Channel 1 (7°C) were considerably cooler than in the rest of the sections and it is suspected that most of the groundwater seepage occurs into this channel. Temperatures at comparable sites during 1993 were several degrees cooler but were measured one week earlier (Bustard 1993).

Dissolved oxygen levels in the ponds were in the 6-9 ppm range, similar to levels measured in 1993 (Bustard 1993). The lowest dissolved oxygen levels were in the middle channel (Channel 2) where there appears to be poor water exchange. Conditions were suitable throughout the entire series of ponds for fish rearing,

Table 2.	Dissolved Telkwa Riv	Oxygen ar ver Ponds	nd Tempe on May	rature Me 17, 1994.	asurement	s in	
DEPTH (m)	L	OWER POND		UPPER POND			
	DO (ppm)	TEMP (°C)	TDS	DO (ppm)	TEMP (°C)	TDS	
Surface	8.2	14.0	119	7.5	14.5	130	
0.5	8.2	13.0		7.6	9.0		
1.0	7.7	12.5		7.5	8.8		
1.5	8.1	11.0					
2.0	8.5	10.5					
	CHANNEL 1		CHANNEL 2				
Surface	7.3	7.0		6.3	16.0		
0.5				6.6	14.0		
	CHANNEL 3			CREEK OUTLET			
Surface	7.2	15.0		8.2	12.5	122	
0.5	7.3	14.5					
	TE	LKWA RIVEN	2				
Surface	11.0	6.5	29				

1098

1000

6

6

and trapping indicated that all of the channels were being utilized by coho in May.

The lower pond has several areas where the depth exceeds 2 m. Many of the sites within the two main ponds are 1-2 m deep providing excellent overwinter sites for coho. Water depths in Channels 1-3 were typically 0.5 to 1.5 m deep. It was noted that a small trickle of surface run-off also entered the top end of Channel 3.

Dissolved oxygen levels ranged from 4-9 ppm on March 11, 1994 at all sites except Channel 3, where dissolved oxygen levels were less than 1 ppm (Greg Bonnell, DFO, personal communication). The top end of Channel 1 was open and 5°C during mid-March, indicating groundwater influence at this site.

#### 3.3 Fish Sampling

Juvenile coho were present in all sections of the ponds. In total 765 juvenile coho were captured during the sampling. Peamouth chub (3) and a single rainbow trout parr were also captured in the ponds. A breakdown of the total catch of fish is shown in Table 3.

The CPUE of coho was similar in all sections (5-7 coho/trap) except in the "debris in creek" section where the CPUE was over 10 coho per trap.

Table 3. Summary of Fish Captured in Minnow Traps in Sections 1 to 7 of the Telkwa River Ponds, May 1994.					
SECTION	NUMBER OF TRAPS	Соно	OTHER	COHO CPUE <sup>2</sup>	
Lower Pond	30	160	PM chub -2 Rbt - 1	5.3	
Creek- Debris	10	102	-	10.2	
Creek -Rock	10	61	-	6.1	
Upper Pond	20	99	PM chub -1	5.0	
Channel 1	20	98		4.9	
Channel 2	20	115	_	5.8	
Channel 3	18	130	-	7.2	
TOTAL	128	765		6.0	

Juvenile coho fork lengths ranged from 53-127 mm (Figure 2). It is assumed that the sample consisted of a combination of age 1+ and age 2+ fish. No scales were taken for aging and the length-age relationships for coho in these ponds may be quite variable depending upon time of entry into the ponds the previous year. The mean fork length of coho <75 mm was 66.3 mm while coho larger than 74 mm averaged 100.6 mm.

<sup>&</sup>lt;sup>2</sup> CPUE refers to catch of coho per trap.

Table 4 summarizes the results of the population estimates by section and size. The total population estimate for all coho in all sections was 2640 fish (95% confidence intervals of 2042-3238). Of this, 2304 (87.3%) were 75 mm or larger coho and it is assumed many of these fish will be leaving the ponds as smolts within the next month. This compares with a total estimated coho population in the ponds in 1993 of 1186 fish including 222 smolts (Bustard 1993).

Table 4. Juvenile Coho Population Estimates in the Telkwa River Ponds, May 1994.						
SECTION	SIZE CLASS (mm)	M3	C4	₽⁵	N <sub>6</sub>	95% CI <sup>7</sup>
LOWER POND	>74	80	71	15	363	220-506
CREEK-DEBRIS	>74	46	49	9	234	116-352
CREEK-ROCK	>74	25	30	1	402	136-940
UPPER POND	>74	44	53	8	269	122-416
CHANNEL1	>74	46	51	9	243	120-367
CHANNEL 2	>74	40	50	6	298	106-489
CHANNEL 3	>74	37	78	4	599	115-1084
ALL SITES	>74	318	382	52	2304	1777-2832
ALL SITES	<75	22	43	2	336	63-692
TOTAL	All	340	425	54	2640	2042-3238

Coho smolts were captured in all sections of the pond. It is expected that the estimates by section are skewed by fish moving between sections. In particular, fish that were marked in the creek section may have dropped into the lower pond, leading to a low estimate in this section and an unrealistically high estimate

- <sup>3</sup> M refers to the number of coho initially marked.
- <sup>4</sup> C refers to the total number of coho recaptured.
- <sup>5</sup> R refers to the number of recaptured coho with marks.
- <sup>6</sup> N refers to the estimated population.
- <sup>7</sup> CI refers to confidence intervals.

in the creek itself. Schools of coho smolts were observed in the lower ponds and we suspect the population in this section was higher than the 363 estimated. A more detailed breakdown of the estimates is presented in Appendix 1.

There may have been some smolt outmigration prior to the beginning of sampling (May 17). However, data collected at a pond site in the Morice indicated that the smolt movement from a pond started during the last week of May and continued through June at temperatures ranging from 6-20°C (Bustard 1986).

### 4.0 CONCLUSIONS

The "caged box inlet" in conjunction with a wire cage on the outlet of a submerged culvert appeared to provide an effective means of providing juvenile fish access into the Telkwa ponds. Similarly, no dams were constructed at the outlet of the upper pond where fencing and a log debris placement were located at the outlet control culvert. Beavers continue to use the ponds and were observed during the surveys.

Water quality conditions were suitable for juvenile coho rearing throughout the complex during the mid-May period. Measurements conducted during the winter (mid-March) also indicated dissolved oxygen levels were adequate in most sections of the pond complex for juvenile coho survival.

The mark-and-recapture estimate conducted during mid-May 1994 indicated approximately 2304 coho smolts were present in the pond complex at this time. This represents a ten-fold increase from the 1993 estimate. Non-smolt juvenile coho numbers were estimated at 336 fish, approximately one-third of the number estimated in 1993 (964 coho).

The higher smolt numbers presumably reflect a greater amount of accessible habitat throughout the site. The extensive amount of habitat deeper than 1 m provides excellent overwintering for coho rearing in this site. As the food base develops in the newlyconstructed sections of the pond habitat, it might be anticipated that coho smolt production from the ponds could increase as long as adequate fry recruitment into the ponds occurs.

Newly-emerged coho fry were observed just downstream from the culvert during the mid-May sample period indicating that this is an important period for coho recruitment into the pond complex.

## **5.0 LITERATURE CITED**

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#### (PHOTOS ON FOLLOWING PAGE)

#### Photo 1 (top left)

Lower pond showing caged culvert inlet structures.

### Photo 2 (top right)

Connecting channel between upper and lower pond - rock cover.

### Photo 3 (lower left)

Logs and fencing at outlet to upper pond.

### Photo 4 (lower right)

Channel 1 collects groundwater and feeds into pond complex.



## **TELKWA PONDS POPULATION ESTIMATES - SECTIONS 1 AND 2**

#### file = TELPOP

Loss

100

150

isti i

iver:

1

Land

1000

laid

1488

1.659

100

land



## TELKWA PONDS POPULATION ESTIMATES - SECTIONS 3 AND 4





### TELKWA PONDS POPULATION ESTIMATES - SECTIONS 5 and 6

1000

**John** 

latesi.

146

1044

1000

1/38

**Joint** 

1:00

62

100

198

100





## TELKWA PONDS POPULATION ESTIMATES - SECTION 7 AND COMBINED





TELKWA POND P	OPULAT	ON EST	IMATES - ALL	SITES COMB	NED < 75 m	m
ALL SITES COMBINED < 7	/5 mm					
						7
# OF COHO MARKED MA	<b>AY</b> 11/12		22		(M+1) (C+1)	
# OF COHO CAUGHT MA	Y 15/16		43		N =	-
# OF MARKED COHO RE	CAPTURED	MAY 15/16	2		R+1	
-						
N =	1012.00	=	336.3			
	3					:
SE =	0.290659	0.539128	181.33 X 1.96 =	355.4 Is 95% con	f N = 691.7	v —

#### JUVENILE SAMPLING AT MORICE PONDS MAY 1-2, 1994

Sampling was conducted by David Bustard and Associates at the Morice River Pond Sites (site of enhancement work by DFO during the summer of 1992) on May 1 and 2, 1994. A total of 35 minnow traps were baited with roe and set overnight. This included 25 traps in the old lower pond and 10 traps in the newly-constructed channel.

The water is high in the Morice and the ponds. The ice is just off the ponds and bits of ice were still present in shady edge sites. Ice formed on the ponds overnight making trap retrieval rather difficult (by boat).

A total of 10 coho and 1 Dolly Varden were captured, so the sampling program was discontinued due to what appears to be very poor survival of coho at this site. Coho juveniles ranged from 69 to 100 mm (mean fl of 82.7 mm). The Dolly Varden was 106 mm.

The beaver dam on the outlet creek was opened during mid-May of 1993 and it is assumed that newly-emerged coho fry observed holding below this dam were able to move up into the pond complex in 1993. It is assumed that water quality conditions, either during the late summer or the winter period lead to poor survival at this site. Dissolved oxygen levels were excellent during the May sampling (Table 1).

The outlet creek was examined from the road down to the Morice sidechannel. The beaver dam has been washed out and there is no impediment to fry movement up into the ponds. A large spruce has blown down in the vicinity of the old beaver dam. No coho fry were observed along the channel and it is assumed this inspection was conducted just prior to the first newly-emerged coho showing up at this site (based on their presence on May 10, 1993).

There was some flow between the new channel and the old pond and two coho were captured in the shallow connecting channel. However, the main inflow creek had approximately 10 times the flow (1-2 cfs) and by-passed the new channel complex.

DEPTH (m)	OLD POND	(outlet)	NEW CHANNEL	MID-SECTION)
	DO (ppm)	TEMP (°C)	DO (ppm)	TEMP (°C)
Surface	10.8	8.0	9.8	11.5
1.0			10.3	6.3