ANNUAL REPORT FOR TOBOGGAN CREEK HATCHERY OPERATIONS IN 1988/89

Toboggan Creek Salmon and Steelhead
Enhancement Society

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Introduction

The Toboggan Creek Hatchery, under the direction of the Toboggan Creek Salmon and Steelhead Enhancement Society, has just completed its fourth successful year of operation under contract with the federal Department of Supply and Services. The hatchery facility is located 13 kilometers north-northwest of Smithers, British Columbia on Highway 16 West (Fig. 1). It is situated on C.N.R. right-of-way which is in turn leased to Fisheries and Oceans Canada for a nominal fee for use as the hatchery grounds. Funds for this contract were provided by the provincial Ministry of Environment (Fisheries Branch) and the federal Department of Fisheries and Oceans (Community Economic Development Program), all of which are involved with the federally funded Salmonid Enhancement Program.

Over the past 30 years, and in particular the last decade, stocks of steelhead, coho and chinook native to the Skeena River system have been severely impacted by commercial, native Indian and sport fisheries. Some coho stocks, those specifically in the Bulkley-Morice and upper Skeena rivers, have had dangerously low escapements in the last few years. This was particularly evident in both 1987 and 1988 on the tributaries of the Bulkley and Morice! This hatchery and others in the northwest could not find enough broodstock to meet modest egg targets needed for enhancement purposes !!!

The Toboggan Creek facility, constructed in 1984/85, has been attempting to preserve and enhance endangered stocks of the three aforementioned species. During the 1988/89 contract period our society reared and released 72,000 coho and 124,000 chinook salmon smolts from the 1986 brood year, as well as 105,000 steelhead fry from the 1988 brood. Also, successful rearing of over 235,000 coho and chinook salmon from the 1987 brood continued and releases of these stocks is scheduled for the spring of 1989.

Egg targets of 1988 brood chinook salmon from the Bulkley River were easily met and at present we have over 103,000 alevins incubating in heath trays. Escapements of chinook were good in 1988 and the upper Bulkley River had between 800 and 1,000 spawners return to the system.

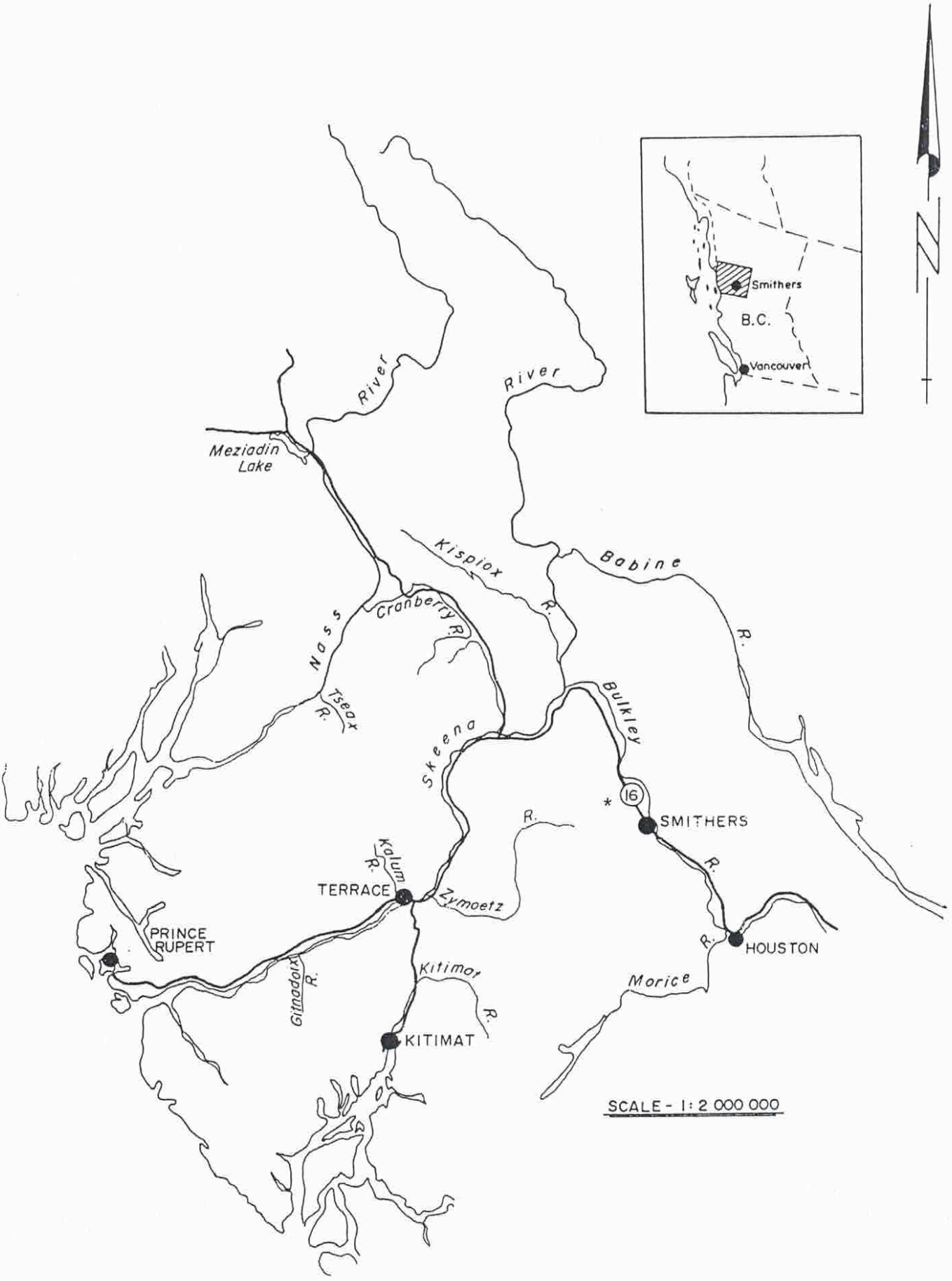


Fig.1 Location of Toboggan Creek Hatchery near Smithers, B.C. *

Coho egg targets were reached on the Toboggan Creek stock only in 1988, the other two stocks identified as being in need of enhancement had insufficient escapements of spawners to supply us with any eggs. The upper Bulkley River coho and the Kathlyn Creek coho stocks are on the verge of extinction as a result of indiscriminate harvesting on the north coast of British Columbia. The Bulkley River has habitat capable of supporting thousands of coho spawners yet only 2 adult coho salmon were observed returning to the system in 1988. Kathlyn Creek has the capability to support hundreds of coho adults, only 5 were seen in 1988. As a result of this situation an additional 75,000 coho eggs were taken from Toboggan Creek broodstock for the purpose of transplanting into the upper Bulkley River and Kathlyn Creek. At present we have 115,000 Toboggan Creek coho alevins incubating in heath trays.

Initially, this hatchery was constructed to enhance and to supplement wild stocks of salmon and steelhead in the Bulkley and Morice systems. In the case of the coho we are unable to fully utilize our enhancement capabilitites because of a lack of available broodstock. In 1988 as few as 1,700 coho salmon returned to the entire Bulkley/Morice system to spawn, almost 27.0 % of these fish returned to Toboggan Creek with the few remaining scattered throughout the many other tributaries of the drainage. Of the 447 coho which did return to Toboggan Creek in 1988 only 185 were wild fish, the rest of the coho run were hatchery returns from the 1985 brood year. Only 185 coho returned from the 1985 spawning escapement of over 400 coho, a decline of close to 60.0 % in one cycle!

The Toboggan Creek Hatchery has the capacity to rear 230,000 salmon to 15.0 gram smolts and 20,000 steelhead to 6.0 gram fry on a yearly basis. Initial incubation is accomplished in moist incubators and eggs are transferred to heath trays at the eyed stage, egg to fry survival is usually over 98.0 %.. Ponding and initial rearing is done in capilano troughs and the fingerlings are transferred to an earthen rearing channel prior to the winter period to make room for the ponding of fry from the following brood year. Smolt releases occur in April and May to coincide with peak migration of wild smolts. Ponding to release survivals usually exceed 95.0 %, a period of 12 months. Two full-time personnel are required to operate the facility and extra manpower is hired during the summer months.

The facility is frequented by over 2,000 visitors yearly and our society encourages the public to learn more about the salmonid resource in British Columbia. The Toboggan Creek Salmon and Steelhead Enhancement Society greatly appreciates the opportunity to be involved in this effort to enhance and protect the wild salmon and steelhead stocks in the Bulkley Valley!

Objectives

i) enhance stocks of anadromous fish species in the Bulkley-Morice drainage which are identified as being below historic levels.

ii) provide C.W.T. groups of Bulkley-Morice salmon and steelhead stocks to aid in identifying movements and timing through the commercial fishery.

iii) maintain a high public profile of the facility and inform the local population of the goals of the C.E.D.P. and S.E.P. programs.

iv) provide employment and training for local students, develop a core of qualified local people which can be depended upon for temporary labour requirements with respect to fish culture in this area.

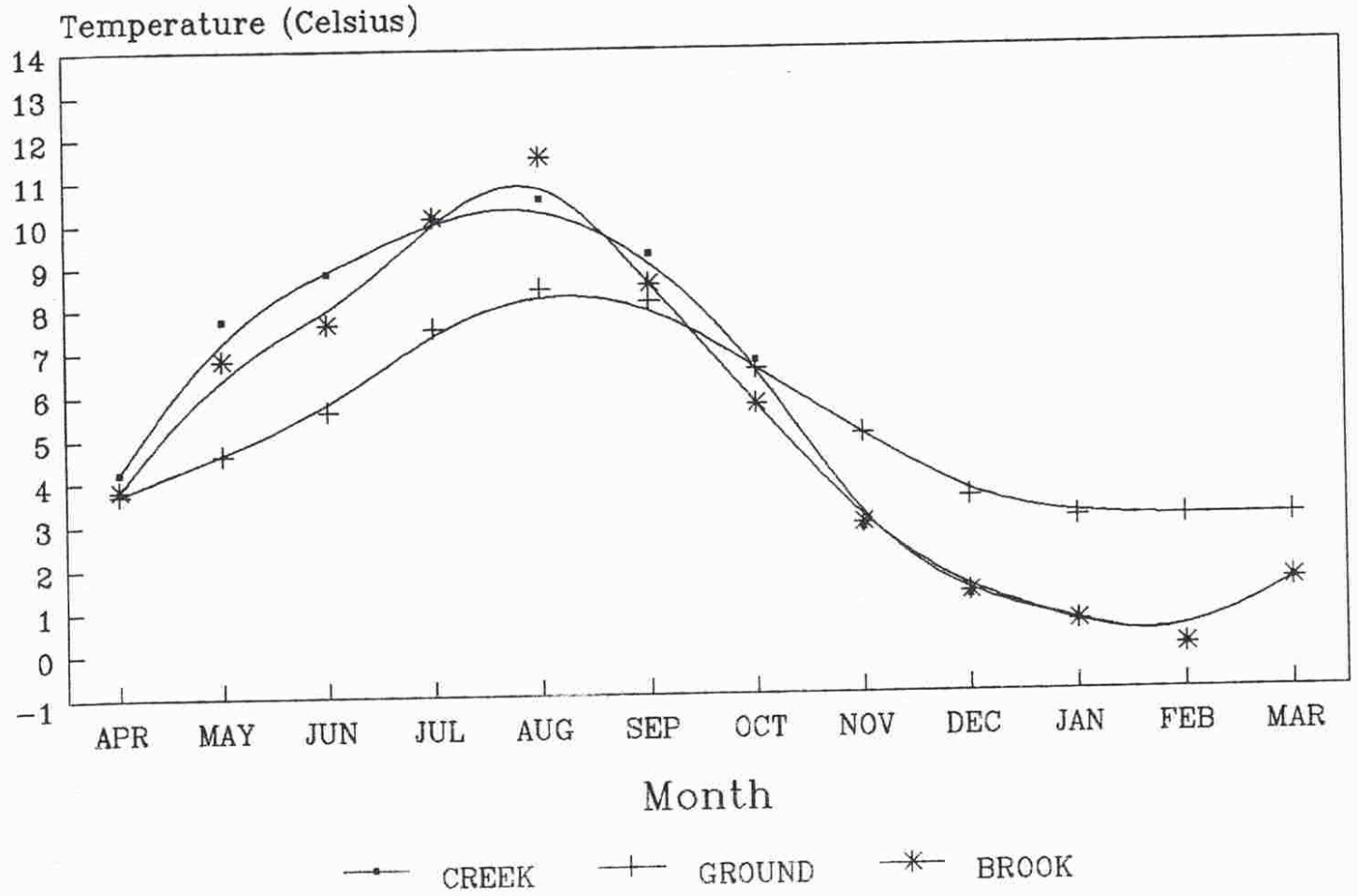
TOBOGGAN CREEK HATCHERY - STEELHEAD BROOD YEAR SUMMARY (1988)

Temperature Data

As in the previous three years average daily temperatures of the three hatchery water sources were recorded and average weekly temperatures have been calculated (Fig. 2). Again, the overall temperatures were fairly consistent with past year's averages. Peak temperatures occurred somewhat later than the usual due to a relatively cool, wet July. During the ponding and feeding period for steelhead the average hatchery water temperatures were 9.5 degrees Celsius, this was very similar to the 1987 rearing program which averaged 9.3 degrees. Water temperatures over the winter period were again consistent with past years.

Other than for initial incubation, which is done using the moist incubation system, all steelhead incubating and rearing is done using Toboggan Creek water as it is consistently our warmest water supply from May through September.

Fig.2 Water Temperatures
at Toboggan Creek Hatchery (1988/89)



Egg-Take and Incubation

The 1988 brood Suskwa River steelhead eggs were delivered on schedule by provincial Fisheries Branch personnel between May 9 and 24, 1988. All eggs were transported "green" to the hatchery facility from the Seymour Lake holding area. The eggs were fertilized, water hardened and placed directly into moist incubators for initial incubation immediately after arriving at the hatchery. Initial egg targets of 181,000 steelhead eggs were not realized and approximately 126,000 green eggs were provided by the regional Fisheries Branch.

Again , all eggs were initially incubated using the moist incubators and the air in the incubation room was heated to accelerate egg development. We attempted to reduce dramatic temperature fluctuations to address the problem experienced in 1987 where we noticed varying degrees of egg development within a given tray of eggs. This tactic understandably did increase the number of days required for incubation, from 63 in 1987 to 70 in 1988, and as predicted it did decrease the variance in egg development. Although it did not completely solve the problem, mortalities of unbuttoned fry due to the stress of ponding were reduced.

Shocking and picking of the 1988 brood steelhead eggs began on schedule at 220.0 A.T.U.'s and the results were similar to previous year's, some of the trays had excellent survivals while others were poor (Table I). There was one tray in the second batch (May 12) that had survivals of less than 50.0 %, it appears one of the two female's eggs incubating in this tray went totally unfertilized even though the entire batch was fertilized in a similar manner using the same males' sperm. Overall survivals to the eyed stage were 91.2 % and all steelhead eggs were transferred to heath stacks at this time. Fecundity of the brood females in 1988 averaged 5,475 eggs per fish, similar to 1987 (5,387 eggs).

Mortalities during hatch were higher than normal in 1988 and there were a fair number of alevins showing coagulated yolk problems, the resultant mortalities slightly surpassed 8.5 %. Although difficult to substantiate I feel this problem is directly attributable to the increased incubation temperature in attempting to accelerate egg development.

Table I. Shocking and Picking Summary for 1988 Brood Suskwa River Steelhead Eggs Incubated at Toboggan Hatchery

Take Date	# Does	#Eggs Taken	Average Fecundity	PreShock Morts(%)	PostShock Morts (%)	Survival (%)
May09	6	35,333	5,889	395 (1.1)	254 (0.7)	34,684 (98.2)
May12	6	32,070	5,345	2,273 (7.1)	4,122 (12.8)	25,675 (80.1)
May17	9	45,999	5,111	2,457 (5.3)	1,415 (3.1)	42,127 (91.6)
May24	2	12,522	6,261	52 (0.4)	112 (0.9)	12,358 (98.7)
**	23	125,924	5,475	5,177 (4.1)	5,903 (4.7)	114,844 (91.2)

7/

Ponding, Feeding, Growth and Survival

Ponding of the 1988 brood Suskwa River steelhead fry occurred between July 18 and 20, 1988. Approximately 108,293 steelhead were ponded in one capilano trough and feeding of these 0.22 gram fry was initiated using #2 Biodiet starter. Feed size was gradually increased as the fry grew and we continued to feed Biodiet moist feed throughout the rearing period. Initial ponding densities reached 37.8 kilograms per cubic meter by mid August and the fry were split into two troughs when they attained 0.75 grams in weight. As in previous years growth was slow at first but accelerated steadily to late September when these fry had reached an average weight of 2.48 grams (Fig. 3).

Survival of fry from ponding to release was good (96.2 %) with the majority of the mortalities as a result of the unbuttoned fry ponded. All fry were treated with a flush of malachite/formalin solution in late July as a precautionary measure to control parasites present in our water supply. The Trichodina parasites were evident but had not become a serious problem prior to treatment.

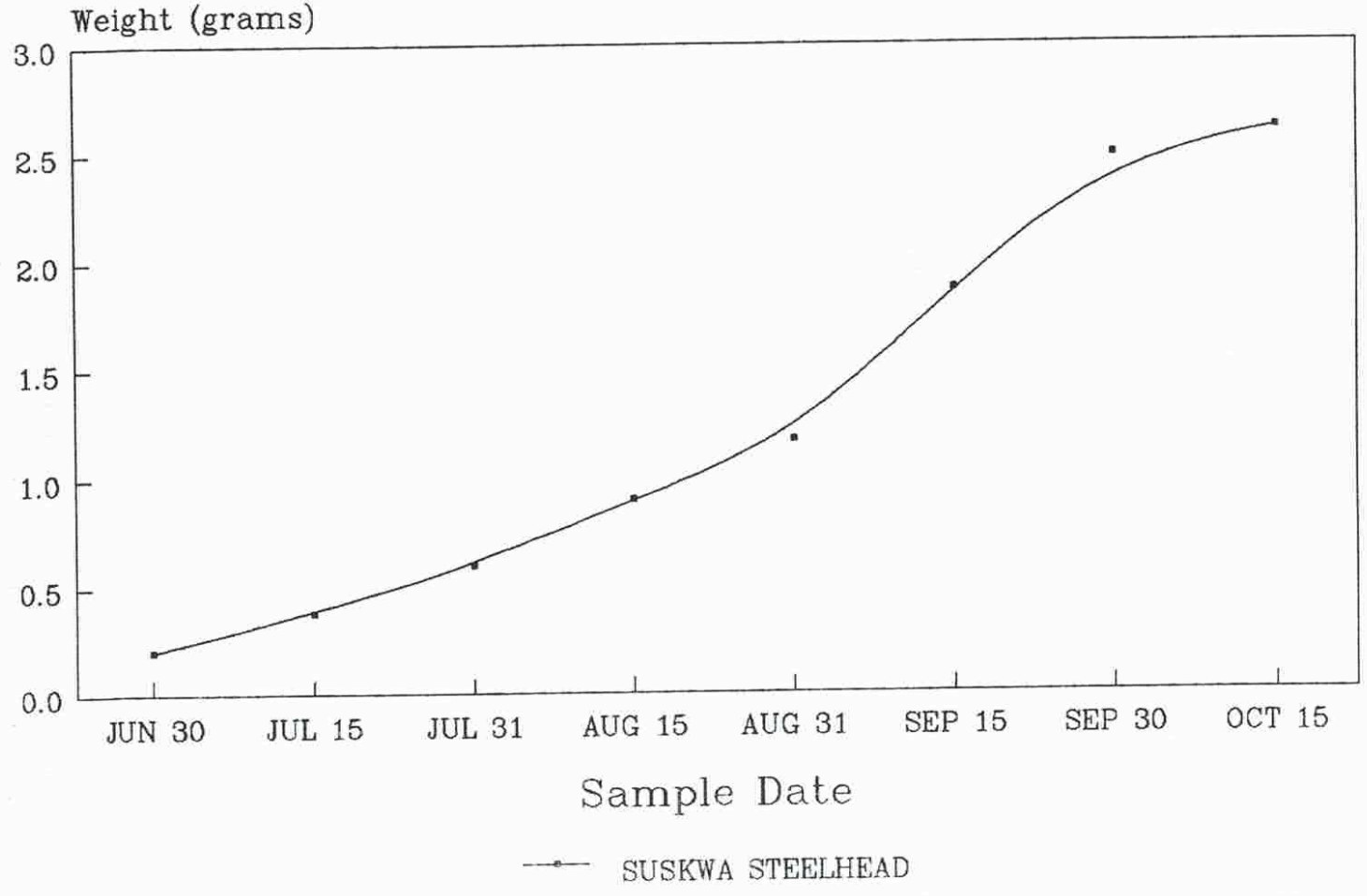
Steelhead egg to release survivals averaged 82.7 % in 1988, very close to survivals during the same period for the 1987 brood (82.9 %).

Tagging and Release

Coded-wire tagging of the 1988 brood steelhead commenced on October 8 and concluded on October 14, 1988. Over 90.0 % of the fry were of taggable size and our estimate of 105,000 fish was verified. As yet I have not received a coded-wire tagging summary from the tagging contractor. Approximate results are as follows :

Tag Code	Steelhead
12-23-29	52,249
12-23-30	41,646
adipose clip only	8,371
unclipped	3,000
Total	105,266

Fig. 3 Growth of Steelhead at Toboggan Creek Hatchery (1988/89)



Immediately after clipping and tagging all troughs of these steelhead fry were treated with a Chlorimine T flush on three consecutive days. This flush was done to prevent a subsequent bacterial infection which has been evident in previous years in the area of the clipped fin. As a result of this flush the infection was not apparent in 1988. Tag retention and fry survivals during and after tagging appeared to be very good.

Release of the 1988 brood steelhead fry occurred on October 26, 1988 and as usual went very well, approximately 105,000 Suskwa River fry were transported by truck to the Harold Price Creek drainage and were released utilizing a helicopter to spread them throughout the system. Hatchery personnel were on hand to assist Ministry of Environment staff on this fry release. Average size at release was 2.6 grams.

The 1987 brood steelhead yearlings which were overwintered at the hatchery were also released in 1988 on July 19. Hatchery personnel assisted Ministry of Environment staff in spreading approximately 26,500 of these 6.0 gram yearlings throughout the Harold Price system. Method of liberation was similar to the 1988 brood fry release and these fish were very healthy at release as well, their condition coefficient being 1.00 at this time. Survivals of this batch of fish were 95.4 % from ponding to release, a period of one full year.

This concludes four years of successful steelhead fry rearing and stocking from this facility, over this period a total of 507,000 steelhead fry have been reared and released into the Bulkley/Morice drainage. The Toboggan Creek Salmon and Steelhead Enhancement Society appreciates the excellent working relationship we have had with the provincial Fisheries Branch staff over the past four years of operation.

TOBOGGAN CREEK HATCHERY - SALMON BROOD YEAR SUMMARIES

Bulkley River Chinook (1986 brood)

The 1986 brood Bulkley Chinook were liberated into the upper Bulkley River between April 12 and April 27, 1988. These 12.9 gram smolts were transported by truck to the release site and approximately 123,619 chinook were released throughout the Bulkley River upstream of the Highway 16 bridge crossing west of Houston, British Columbia.

Below Buck Creek confluence	16,695
Knockholt road crossing	11,938
McQuarrie groundwater area	26,301
McQuarrie Creek	21,300
Above McQuarrie confluence	13,730
Topley road crossing	19,276
Meanwhile road crossing	14,379
Total Released	123,619

These releases took the better part of 3 weeks to complete as we could transport only 6,000 fish per trip at maximum load rates. Everything went very well on all the releases and the smolts looked very healthy at this time. Green egg to release survivals of this stock were 89.2 % over a 20 month period.

This stock was enumerated prior to release using standard subsampling techniques. Results of this enumeration closely coincided with our ponding/survival estimates.

Bulkley River Chinook (1987 brood)

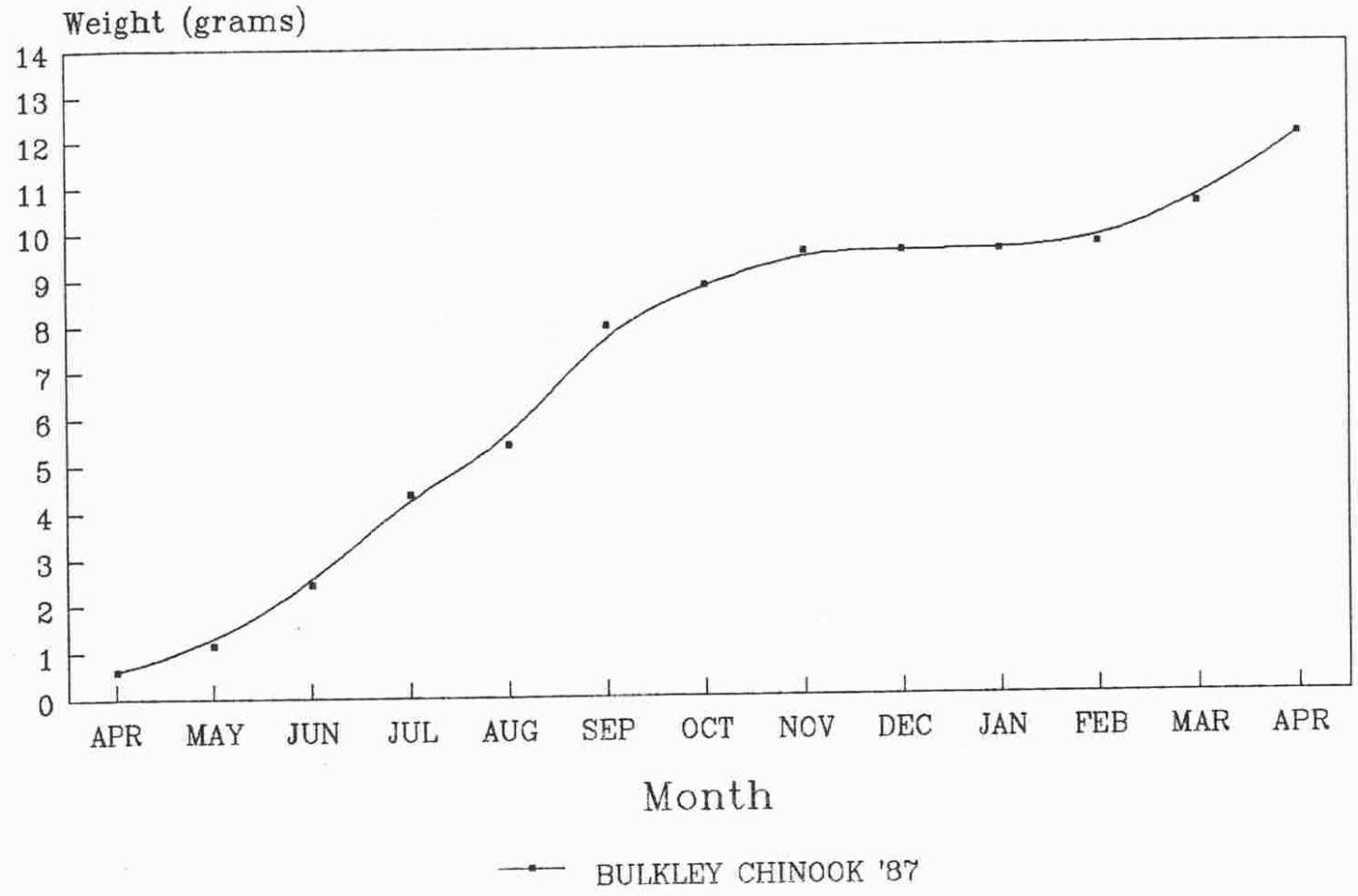
Growth of the 1987 brood Bulkley River chinook fry increased rapidly commencing in mid April, in conjunction with warming water temperatures, and the fish continued to grow rapidly through the summer period (Fig. 4). By September these fish were averaging over 7.5 grams in weight.

We began ventral clipping these chinook fry in mid July when they had attained an average weight of 4.0 grams and by mid August approximately 85,000 chinook had been left-ventral clipped and transferred to compartment "B" of the rearing channel. By August 24 the remaining 1987 brood Bulkley River chinook fry were coded-wire tagged and adipose clipped and had been transferred to the outdoor rearing channel. As a result of enumeration done during clipping procedures our initial estimates were revised upwards by approximately 7.0 % to 114,456 chinook; 31,800 of which were coded-wire tagged. The screen between compartments "B" and "C" of the outdoor rearing channel has been removed to allow this stock to have adequate rearing space. Presently there are approximately 114,171 rearing in these two compartments and releases are scheduled to begin in mid April of 1989.

Growth of the 1987 brood chinook was similar to that of the 1986 brood the previous year with the exception of the winter period. Due to persistently cold atmospheric temperatures in the winter of 1988/89 we were unable to feed the salmon that were rearing in the outdoor channel on a consistent basis. This resulted in slower than normal growth from December to late March. At present these chinook fry are averaging 9.7 grams in weight, estimated weight at release will be in the area of 11.0 to 12.0 grams.

Survivals since ponding have been very good and presently are over 96.5 %, green egg to release survivals are expected to exceed 94.5 %.

Fig.4 Growth of Chinook Salmon
at Toboggan Creek Hatchery (1988/89)



Bulkley River Chinook (1988 brood)

Broodstock collection of the 1988 brood chinook from the upper Bulkley River commenced on August 20, 1988 and by August 24 we had attained our egg target of 105,000 eggs. Hatchery personnel received some much appreciated assistance from members of the Houston Steelhead Society as well as from D.F.O. stream guardian Sam Wright of Houston.

We did not attempt to hold any adult chinook this year and we collected all of our broodstock off of the redds. Chinook spawners were widely dispersed with the majority being able to access the upper portions of the river below Bulkley Falls with some evidence of spawning above the falls as well. We concentrated our egg take efforts in the Richfield Creek area and the section 2.0 kilometers downstream of McQuarrie Creek.

Eggs were collected from 31 female chinook, 13 of which were partially spawned, and using fecundity estimates from the 3 previous years we determined this was adequate to achieve our target of 105,000 eggs. Brood females averaged 27.3 inches in length (hypural) and weighed 12.6 pounds. Milt was expressed from 37 male chinook during the course of the egg takes and each female's eggs were fertilized with the sperm from two different males, some male's sperm was used for more than one female and all males were released after expression. Scale and fin samples (dorsal/pectoral) were taken from 25 chinook and have been sent to the Biological Station for analysis.

We did not get to see as much of the system as normal because of time constraints but I have included the following summary of observations :

Meanwhile Creek	30 chinook (15 female,15 male)
Richfield Creek	80 chinook (35 female,45 male)
McQuarrie Creek	20 chinook (10 female,10 male)
below McQuarrie	120 chinook (50 female,70 male)
Houston	50 chinook (15 female,35 male)
Total observed	300 chinook(125 female,175 male)

From observations made during broodstock collection this year I would conservatively estimate the chinook escapement to the upper Bulkley River to be between 800 and 1,000 adults this past summer (1988). This is the strongest return of spawners we have seen during our 4 years of work on this system. This population estimate was documented and submitted to the local D.F.O. office in Smithers at the conclusion of the fieldwork.

Spawning dates were consistent with past years and the peak spawning occurred between August 21 and 24, 1988. Chinook eggs were taken in the field and transported to the hatchery prior to fertilization. After fertilization all eggs were placed directly into moist incubators for initial incubation purposes.

Shocking and picking of the 1988 brood Bulkley River chinook eggs was done on September 19, 1988 at 280.0 A.T.U.'s and these eggs were transferred to heath stacks at this time. Survivals to the eyed stage were very good, averaging 98.8 % (Table II). Volume estimates done at eyed stage verified our spawning estimate of 105,000 eggs collected.

Development has been slowed as much as possible to delay the ponding process until our rearing temperatures begin to rise. As a result we have not as yet ponded any 1988 brood chinook fry and do not expect to do so until late March. At present we have approximately 103,700 chinook alevins incubating in two heath stacks.

Toboggan Creek Coho (1986 brood)

Releases of the 1986 brood Toboggan Creek coho commenced on May 9, 1988 and by May 27 all of these 14.8 gram smolts had been liberated. Most of these coho were transported by truck to release sites upstream and downstream of the hatchery, the remainder were allowed to migrate out of the rearing channel into Toboggan Creek on their own initiative. These releases coincided with the peak migration of wild coho smolts.

Approximately 71,307 coho smolts were released and looked to be very healthy overall with a condition coefficient of 1.04 at this time. Release sites and numbers are as follows:

Toboggan Creek (above Elliot Creek)	18,000
Toboggan Creek (between Elliot Creek and hatchery)	15,000
Owens Creek (a tributary to Toboggan Creek)	11,000
Toboggan Creek (released directly from channel)	27,307
Total Released	71,307

Survivals of this stock from ponding to release were 94.1 % and green egg to release survivals surpassed 93.0 % over a 20 month period.

Table II. Shocking and Picking Summary for 1988 Brood Bulkley River Chinook Eggs Incubated at Toboggan Hatchery

Tray #	Pre Shock	Post Shock	50 ml Sample	Volume (mls)	# Incubated	# Remaining
E2	6	21	114(2.28)	3460	8362	8335
E3	3	88	118(2.36)	3530	8831	8740
E4	30	65	118(2.36)	3300	8255	8160
E5	11	35	145(2.90)	3250	9991	9945
E6	27	80	114(2.28)	3420	8266	8159
E7	13	50	112(2.24)	3930	9331	9268
F2	17	182	119(2.38)	3600	9082	8883
F3	31	49	110(2.20)	3220	7509	7429
F4	38	189	136(2.76)	3030	8865	8638
F5	39	101	121(2.42)	3520	9029	8889
F6	6	60	123(2.46)	3320	8657	8591
F7	10	79	127(2.54)	3420	9208	9119
Total	231	999	122(2.42)	41,000	105,386	104,156
(%)	(0.2)	(1.0)				(98.8)

* A correction factor of 1.06 has been identified based on previous year's variances between eyed egg/tagging numbers

Kathlyn (Chicken) Creek Coho (1987)

Ponding of this stock of coho fry commenced on April 26, 1988 and was complete by May 10, these fry averaged 770.0 A.T.U.'s at ponding. Approximately 27,537 coho were ponded and green egg to ponded fry survivals were excellent at 98.9 %.

Water temperatures at ponding averaged 4.5 degrees Celsius, weight of fry was 0.20 grams. Growth of these fry increased with the warming water temperatures in May and June and by the end of July they were averaging over 3.0 grams in weight (Fig. 5).

Since this coho stock was not slated for coded-wire tagging it was decided to ventral clip them so we would be able to identify them when they return as adults in 1990. All coho fry were right ventral clipped between August 16 and 20,1988.

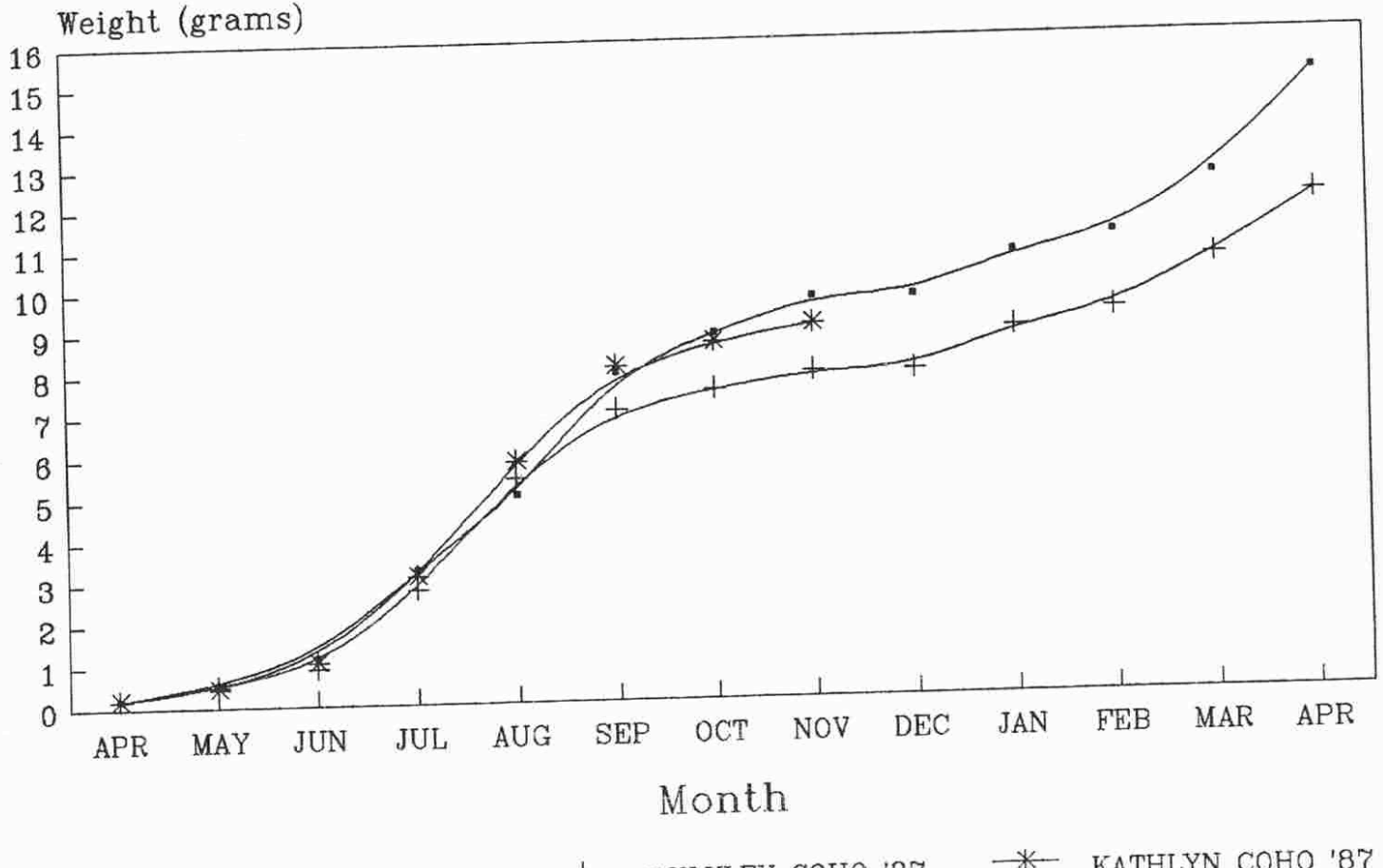
The 1987 brood coho from Kathlyn Creek were released between November 7 and 8, 1988. Due to an anticipated shortage of trough space by April of 1989 it was decided to release these fish prior to freeze-up as opposed to holding on to them and releasing in April. Results from releases in 1987 indicate April liberations are not desireable with late May being the optimum timing for coho releases. Since we could not hold on to this stock until May of 1989 we opted to plant these 9.0 gram fingerlings in Kathlyn Lake and Creek and compare adult returns of these fall plants with returns from smolt plants of the other coho stocks scheduled for May of 1989. This may identify options for coho enhancement in future years.

A total of 26,637 coho were released at the following sites:

Kathlyn Lake	16,637
Kathlyn Creek (above lake)	3,000
Kathlyn Creek (below lake)	7,000
Total Released	26,637

Survivals of this stock from ponding to release were 96.7 %, green egg to release survivals exceeded 95.6 %.

Fig.5 Growth of Coho Salmon at Toboggan Creek Hatchery (1988/89)



Bulkley River Coho (1987 brood)

Ponding of this stock of coho fry commenced on May 4 and was complete by May 10, 1988. Approximately 50,760 coho fry were ponded at an average of 767.0 A.T.U.'s. Green egg to ponded fry survivals were equal to those of the Kathlyn Creek stock at 98.9 %.

As described in the annual report for 1987/88 only 15,000 of these fry were from pure strain Bulkley River broodstock, the remainder were from Toboggan Creek female's eggs which were fertilized with sperm from Bulkley River coho males. We segregated these pure strain fry into seperate rearing containers to accomodate for coded-wire tagging and clipping procedures which could be used to identify this stock when they return as adult spawners. It was also decided to mark three seperate groups of coho for study purposes to see if there was any difference in returns of pure strain Bulkley coho, Toboggan/Bulkley crossed coho, and pure strain Toboggan coho; all of which were to be reared in a similar manner and released into the upper Bulkley River in the spring of 1989.

Coded-wire tagging and fin clipping of the three groups of coho destined for release into the Bulkley River was done on August 25 and 26, 1988. Tag codes and size of each group of coho marked are as follows:

Stock	# Marked	Tag Code	Fin Clips
Pure Bulkley	12,840	8R3-26-25	Adipose/R. Vent.
Bulkley/Tob.	12,781	8R3-26-26	Adipose/L. Vent.
Pure Toboggan	12,845	8R3-26-22	Adipose/L. Vent.

All of these coho were transferred to compartment "A" of the outdoor rearing channel along with the remaining 23,803 coho fry from the pure and mixed Bulkley stock which were not coded-wire tagged or fin clipped. At present we have nearly 62,000 coho smolts still rearing in channel "A", they will be transported to the upper Bulkley River and released in April of 1989.

Growth of this group of coho was consistent through the warm summer months (Fig. 5) and these fry exceeded 8.0 grams by November. As with the 1987 brood chinook growth through the winter months was slow because of inconsistent feeding as a result of ice cover on the channel. At present these coho are averaging 9.2 grams in weight and have a c.c. of 0.97, their expected size at release should be 10.0 to 11.0 grams.

Green egg to release survivals should surpass 96.5 %.

Toboggan Creek Coho (1987 brood)

Ponding of these coho fry occurred between May 4 and 10,1988. A total of 46,343 Toboggan Creek coho fry were ponded at an average of 744.0 A.T.U.'s. Green egg to ponding survivals were 98.9 %.

Average size at ponding was 0.20 grams and these fry grew rapidly until November when the weighed 8.9 grams (Fig. 5). As with all stocks reared over the winter in the outdoor channel these coho did not grow much between December,1988 and March,1989. At present the Toboggan Creek coho weigh 9.80 grams and have a condition coefficient of 1.00. These smolts will be reared until late May at which time they will be allowed to migrate out of the rearing channel. Average size at release should be close to 15.0 grams.

Coded-wire tagging of this stock was completed on August 24 and 25, 1988 and 31,708 of these coho were tagged and adipose clipped before being transferred to compartment "D" of the rearing channel. The remaining 12,845 Toboggan coho were part of the study mentioned on the preceding page and they will be transplanted into the upper Bulkley River. At present we have approximately 31,596 Toboggan coho from the 1987 brood still rearing in channel "D" , green egg to release survivals will be over 93.0 %.

The coded-wire tagging summary for this stock is as follows:

Tag Code	# Tagged
02-56-03	10,739
02-56-04	10,631
02-56-05	10,338
Total Tagged	31,708

We had a problem with myxobacteria and costia in the Toboggan Creek coho stock in August and lost 2.0 % of these fry as a result. This occurence was as a result of overcrowding prior to coded-wire tagging as we could not transfer these fish to the outdoor rearing channel until they had been tagged. This facility was at maximum loading this summer and perhaps was overloaded. We were able to control this outbreak using feed additives and chemicals and overall survivals have been good.

Coho Egg Collection (1988 brood)

Attempts were made to collect coho eggs from three different streams in the Bulkley/Morice drainage in 1988. The following is a list of those streams and the proposed egg targets for each:

Kathlyn Creek	30,000
Toboggan Creek	40,000
Bulkley River	60,000
Total Egg Target	130,000

No coho eggs were collected from either the Bulkley River or Kathlyn Creek in 1988 due to virtually nonexistent escapement of adults to those systems. It appears neither of these two streams any longer support viable coho runs!! Only five coho were observed to have returned to Kathlyn Creek to spawn, and a coho fence monitorred by members of the Houston chapter of the Steelhead Society of B.C. indicated only two adult coho escaped to the Bulkley River in 1988. These two streams have the habitat capabilities to support coho spawners in the hundreds and thousands respectively. Unfortunately adequate escapements of coho native to these and many other streams in the upper Skeena system are not being allowed through the commercial fisheries on the north coast of British Columbia.

Toboggan Creek egg takes concentrated on early spawners again in 1988 and, as in 1987, there were very few coho spawning in late September and early October. Escapement of coho adults to Toboggan Creek was intensively monitorred throughout the spawning period and the following represents the estimated coho escapement in 1988:

Glacier Gulch Creek	59
Toboggan Creek (above Elliot Cr.)	18
Toboggan Creek (below Elliot Cr.)	370
Total Escapement in 1988	447

We achieved our Toboggan Creek coho egg target by October 14, 1988 and managed to do so utilizing only wild, unmarked coho. In total 12 female's eggs were fertilized using sperm taken from 18 different males, all males were released after each seperate egg take. As in previous years coho females were captured prior to spawning and held inside the facility in covered capilano troughs until they were ripe. Spawning was done inside the hatchery and males were collected from the creek as needed on the day of the egg take. Immediately after fertilization all coho eggs were water hardened and placed directly into moist incubators for initial incubation.

Due to the fact that no coho eggs were available from Kathlyn Creek or the upper Bulkley River in 1988 an additional 75,000 coho eggs were collected from Toboggan Creek females for the purpose of transplanting into those systems. A total of 26 female coho were utilized (15 wild, 11 hatchery), as were 30 males.

Shocking and picking of the 1988 brood Toboggan Creek coho eggs was accomplished between December 13 and January 31, 1989 as they reached 280.0 A.T.U.'s. Survivals to this stage were excellent (Table III) and averaged 98.6 %. All coho eggs were transferred to heath trays for hatching immediately after shocking and picking was complete. Average fecundities of brood females were somewhat less than in previous years at approximately 3,068 eggs per female as compared to 3,553 in 1987.

Coho eggs from the 1988 brood began hatching on February 21, 1989 at 395.0 A.T.U.'s with peak hatch occurring at 410.0 thermal units. Survivals at hatch were excellent and all batches were at alevin stage by late March. At the present time we have approximately 114,700 coho alevins incubating in two heath stacks. Ponding will occur in mid to late May.

A copy of coho egg collection results and escapement data was sent to the local D.F.O. office in Smithers after fieldwork was completed.

Table III. Shocking and Picking Summary for 1988 Brood Toboggan Creek Coho Eggs Incubated at Hatchery

Tray #	Pre Shock	Post Shock	50 ml Sample	Volume (mls)	# Incubated	# Remaining
F2	54	230	169(3.38)	2570	9615	9331
F3	7	120	183(3.66)	2740	11038	10911
F4	38	148	193(3.86)	2780	11846	11660
F5	65	83	162(3.24)	3600	12830	12682
F6	88	77	160(3.20)	3450	12144	11979
F7	63	69	155(3.10)	3530	12037	11905
E4	26	42	208(4.15)	2460	11259	11191
E5	19	128	210(4.19)	2480	11451	11304
E6	27	76	178(3.56)	3460	13580	13477
E7	46	136	161(3.23)	3020	10781	10599
Total	433	1,109	178(3.56)	30,090	116,581	115,039
(%)	(0.4)	(1.0)				(98.6)

* A correction factor of 1.10 has been identified based on previous year's variances between eyed egg/tagging numbers

Assessment of Coho Escapement in 1988

Numerous assessment activities were undertaken by hatchery staff and personnel from the Small Projects Unit of D.F.O. in 1988. A coho fence was constructed and installed on the lower portion of Toboggan Creek by S.P.U. biologist Matt Foy in late August, hatchery staff monitorred the Indian food fishery at Moricetown Falls on the Bulkley River, the sport fishery at the Toboggan Creek/Bulkley River confluence was checked for coho abundance, and an indepth sampling of the escapement of coho to Toboggan Creek was accomplished.

Unfortunately the coho fence did not last very long and had to be removed shortly after completion due to heavy stream flows and subsequent erosion of the bank and substrate. All the other assessment activities were completed without any problems however and indicate some alarming trends.

In cooperation with the Moricetown Indian Band, staff members collected catch information from Indian food fishermen at the Moricetown Falls. Data was collected on a random basis so as to represent the actual composition of the coho run passing through the falls from mid August through to mid September. We began sampling when the first coho were evidenced in the catch and continued until the coho were not present in the food fishery catch. Data collected here was combined with the results of our assessment of the coho escapement to Toboggan Creek to give a clear indication of the state of summer run coho in the Bulkley/Morice system. With a good degree of certainty it was determined that the total escapement of coho to the Bulkley and Morice rivers and their tributaries during 1988 was between 1,700 and 1,800 fish (Table IV) :

i) The estimated number of coho was arrived at by combining the total marked hatchery escapement to Toboggan Creek (262 coho) with the sport catch (6) and the Indian food fish catch (8) to arrive at a total of 276 coho available to the Indian fishermen during the study period.

ii) The total coho catch by Indian food fishermen observed during the course of our study was 52 fish.

iii) The number of marked hatchery fish in the Indian catch was 8 coho. This indicates a couple of things; firstly the Indian fishermen captured 3.0 % of the coho which were migrating past the falls during the study period; secondly over 15.0 % of the coho run to the entire Bulkley/Morice system was made up of hatchery fish in 1988 even though Toboggan Creek was the only stream in the system with hatchery coho returning!

Table IV

Estimate of coho escapement to the Bulkley/Morice River system as a result of sampling done at the Moricetown falls Indian food fishery (1988).

i) estimated number of marked coho available	276
ii) total coho harvest observed	52
iii) number of marked coho in catch	8
iv) proportion of Toboggan Creek coho in catch	14(26.9%)
v) Toboggan Creek coho spawning escapement	447
vi) proportion of marked coho in Toboggan run	262(58.6%)

vii) estimated total escapement of coho past Moricetown falls

(proportion of non-Toboggan coho) X (Toboggan escapement)
(100 / 26.9) X 447 = 1,662 coho

(proportion of coho escaping fishery) X (coho harvest)
(100 / 3.0) X 52 = 1,733 coho

THE ESTIMATED ESCAPEMENT OF COHO ADULTS PAST MORICETOWN FALLS IN 1988 IS IN THE RANGE OF 1,700 TO 1,800 FISH.

iv) A total of 14 Toboggan Creek coho, both wild and hatchery produced, were determined to be in the Indian catch. This indicates that Toboggan Creek coho made up almost 27.0 % of the total coho escapement to the Bulkley/Morice system in 1988.

v) The Toboggan Creek spawning escapement was arrived at by walking the entire creek and observing spawning coho from late September through late November. A total of 447 coho were estimated to have escaped to Toboggan Creek in 1988.

vi) The proportion of marked coho in the Toboggan Creek coho escapement was arrived at by sampling all fish captured during and after broodstock collection activities on the creek by hatchery personnel in September, October and November of 1988. Marked coho were estimated to comprise 58.6 % of the total escapement to Toboggan Creek and the hatchery return was 262 fish (Table V).

These results are particularly disturbing as they clearly indicate the degree to which these coho stocks have declined because of the overexploitation which these salmon have been subjected to in the Pacific Ocean. To better understand the magnitude of this decline one only has to compare this data with documented escapement estimates from previous years on this same system (Table VI). This information was gathered in 1966 by D.F.O. staff and indicates a coho escapement of at least 25,000 and probably in excess of 30,000 coho past the Moricetown Falls in that year as there are fishways on both sides of the canyon. These once strong runs of wild coho have been depleted to the point of becoming extinct in most of the coho producing tributaries on the Bulkley/Morice system!!

It is a well known fact that spawning escapements of coho destined for the upper Skeena drainage have been obviously inadequate over the past few years as a result of overfishing by commercial fleets on the north coast of British Columbia. If this scenario is allowed to continue it will but guarantee the virtual extinction of these unique genetic stocks of wild coho. It will also jeopardize our existence as an enhancement facility as their are inadequate wild stocks of coho left for broodstock purposes.

We attained our coho egg target on only one system in 1988, what will be available in the brood years to come ? Our society has legitimate concerns in this respect and will continue to do whatever is necessary to fulfill our contract obligations and do our best to enhance the few stocks we are able to work with! This alone will not solve the situation in which the coho salmon in this area find themselves and major reductions in the commercial interception of these stocks have to happen immediately if there is any hope in reversing the trend!

Table V

Proportions of marked/unmarked coho salmon adults escaping to Toboggan Creek in the fall of 1988.

i) Downstream of smolt release sites (below Elliot Creek)

	Adipose Clips	Ventral Clips	Unclipped
Males	27	2	12
Females	20	2	11
Percent	63.5 %	5.4 %	31.1 %

ii) Upstream of smolt release sites (above Elliot Creek)

	Adipose Clips	Ventral Clips	Unclipped
Males	4	0	22
Females	0	0	19
Percent	8.8 %	0.0 %	91.1 %

iii) Estimated contribution of marked hatchery coho in the 1988 escapement to Toboggan Creek and tributaries.

	Adipose Clips	Ventral Clips	Unclipped
Total	242(54.1%)	20(4.5%)	185(41.4%)

Table VI

Daily counts of salmon and steelhead trout utilizing the left bank, Moricetown fishway, July 31 to August 27, 1966.

Date	Sockeye	Chinook	Coho	Pink	Steelhead	Unknown	Total
Jul31	70	1	-	-	-	-	71
Aug01	27	-	-	-	-	-	27
Aug02	12	-	-	-	-	-	12
Aug03	55	-	16	-	-	-	71
Aug04	52	3	11	-	-	-	66
Aug05	99	7	42	-	-	-	148
Aug06	95	12	22	-	1	18	148
Aug07	85	22	122	-	-	-	229
Aug08	20	-	84	-	-	-	104
Aug09	14	3	58	-	11	5	91
Aug10	17	-	146	-	10	-	173
Aug11	10	-	343	-	14	5	372
Aug12	45	2	241	-	7	-	295
Aug13	134	9	1,028	15	70	-	1,256
Aug14	124	2	1,077	15	66	-	1,284
Aug15	55	3	396	33	50	-	537
Aug16	10	1	118	13	-	-	142
Aug17	45	-	633	16	16	-	710
Aug18	26	-	367	-	-	-	393
Aug19	93	-	766	5	-	-	864
Aug20	28	-	762	36	-	-	826
Aug21	44	-	3,235	69	-	-	3,348
Aug22	7	-	784	45	-	-	836
Aug23	2	-	1,329	16	-	-	1,347
Aug24	7	-	1,151	4	-	-	1,162
Aug25	7	-	394	2	2	-	405
Aug26	-	-	64	8	-	-	72
Aug27	1	-	226	7	-	-	234
Totals	1,184	65	13,415	284	247	28	15,223

Coho Hatchery Returns (1985 brood)

Coho head depots were set up at Trout Creek Store and at the Toboggan Creek Hatchery. Informational signs were constructed and placed at Trout Creek, the Toboggan Creek/Bulkley River confluence, Moricetown Falls, and at the Bulkley River/Skeena River confluence.A total of 6 coho heads were turned in by sportfishermen and all were caught in the Bulkley River near Trout Creek, these salmon were landed between August 27 and September 10, 1988. From observations made during our creel census efforts at this sport fishery, and through discussions with local D.F.O. officers, an estimated total catch of coho at this location would be around 20 fish for 1988. This does relate closely with our marked/unmarked escapement ratio into Toboggan as a portion of the catch of coho at this location would be transient fish migrating to other tributaries.

A total of 8 coho heads were collected from the female coho we used for broodstock purposes in 1988. These heads along with the 5 heads from the Indian food fishery, and the 6 from the sport fishery were sent in to J.O. Thomas and Associates in early January for dissection and analysis. All 19 heads contained coded-wire tags and were subsequently identified as being from our release of 1985 brood smolts in May of 1987. A summary of these tag codes is as follows:

# of coho	tag code
10	02-39-01
5	02-39-02
4	02-39-03

From this data and the fact no other enhanced stocks of coho are present in the Bulkley/Morice system it can be assumed that all adipose clipped coho observed during our study were indeed Toboggan Creek hatchery returns from the 1985 brood.

Actual returns of C.W.T. hatchery coho into Toboggan Creek were well below expected escapements predicted in the D.F.O. Biostandards. From a release of 31,476 coho smolts in 1987 it was predicted we would see 1,047 adult coho return to the creek as 3 year olds (3.3 %), we estimate a total of 242 coho from this release actually made it back in 1988 (0.8 %). It would appear overall exploitation rates are conceivably as high as 92.0 % rather than the 65.0 % documented in the most recent Biostandards for upper Skeena coho!

Returns of the remaining 1985 brood coho, marked with a right ventral clip, were very poor. We estimate a total of only 20 ventral-clipped coho were present in the creek in 1988. Some of these fish no doubt regrew their fins but this is not what is expected to be a high percentage, as well mortalities of this group may have been higher than normal due to decreased survivability because of the missing fin. The major factor in this poor return however is more likely to be associated with the timing of release of this specific group of smolts. These fish were released in mid April as compared to mid May for the coded-wire tag group. Both groups of smolts were similar in number and size at release. It would appear mid to late May releases of coho will yield the best returns in future!

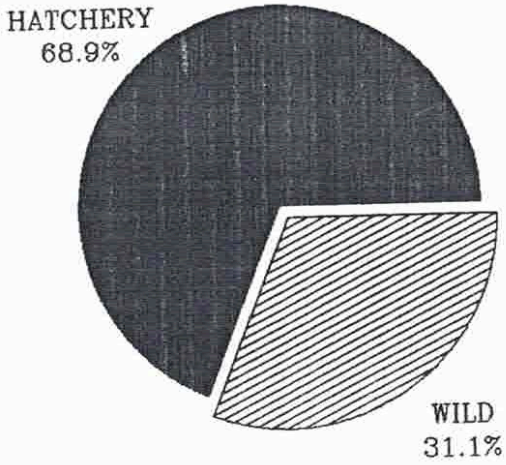
Wild, unclipped coho accounted for only 41.4 % of the overall escapement to Toboggan Creek in 1988, this represents a total of 185 fish (Table V). This estimate may be somewhat higher than the actual wild run as some of these fish may have been hatchery produced coho that regrew their ventral fins. This ridiculously low escapement of wild coho again demonstrates the rapid rate of decline of upper Skeena coho stocks. Only 185 coho returned from the 1985 spawning escapement of over 400 coho, a decline of close to 60.0 % in one cycle!!

The distribution of coho returning to Toboggan Creek in 1988 indicates hatchery produced coho will generally not migrate upstream of their point of release (Fig. 6). Hatchery coho made up only 9.1 % of the coho handled by hatchery personnel above the release sites whereas 68.9 % of the coho caught downstream of this point were fin clipped.

Copies of assessment information gathered in 1988 have been distributed to the local D.F.O. office in Smithers and has been provided to other groups and individuals expressing an interest.

Fig.6 Distribution of Coho
Returning to Toboggan Creek in 1988

ABOVE RELEASE SITES



BELOW RELEASE SITES

Administration Report

As this report is being written before the final progress claim was submitted the following figures represent estimates of where we will be at that time. It appears we will be very close to the total budgetted amount of 129,420.00 for the two contracts for operation of the facility in 1988/89. In past years both the salmon and steelhead contracts were combined into one contract and administered through the Department of Supply and Services. This year these contracts were handled seperately with D.S.S. responsible for the salmon contract and the provincial Ministry of Environment responsible for the steelhead contract.

Following is a breakdown of hours spent carrying out the contract in 1988/89:

Activity	Man-hours
Project Management	1098.0
Facility Operations	3388.0
Broodstock Collection	640.0
Assessment	100.0
Releases	428.0
Training	0.0
Statutory Holidays	192.0
Total Hours in 1988/89	5846.0

Overall the contract went quite well in 1988/89 although we had a high employee turnover during the contract period. It is to be expected as very few people will commit themselves to temporary employment on a long term basis, our manpower demands are seasonal and vary greatly from summer to winter making it necessary to depend on temporary people to a fair extent. This requires many hours to be spent familiarizing and training new people to carry out the tasks. We have had many local students who began their first job here who have successfully gained future employment as a result of work experience gained at this facility. As far as the C.E.D.P. Program's goals it seems the benefits outweigh the costs in this regard.

The following is a summary of expenditures in carrying out the 1988/89 contract:

Category	Steelhead Contract	Salmon Contract
Direct Labour	22,942.00	43,310.00
Overhead	5,736.00	10,828.00
Capital Equipment	1,000.00	0.00
Operations & Maintenance	14,200.00	20,328.00
Travel and Living	608.00	9,967.00
Total Expended	44,486.00	84,433.00
Total Budgetted	45,000.00	84,420.00
Variance	514.00	<13.00>

Total employment generated by the hatchery in 1988/89 was 146 work weeks, employing 18 different people.

Development and Maintenance of the Facility

In addition to general maintenance carried out as part of the contract requirement the following activities were necessary as well:

i) The rearing channel was drained and allowed to dry out after the 1986 brood salmon releases were completed. A large backhoe was brought in to dredge the sediment and to deepen and widen the channel for rearing purposes in 1988/89. After dredging the channel was flushed and the screened channel dividers were repaired and reinstalled prior to transfer of the 1987 brood salmon outside into the channel.

ii) The settling pond was dredged twice in 1988 to remove sand which had accumulated as a result of the intake in the creek being below the level of the streambed, sand migrates along the streambed and is sucked down through the intake screen and deposited in the settling pond. As the sand accumulates in the pond it blocks the flow coming in and eventually begins to backfill the pipe connecting the creek intake to the settling pond. The entire fence surrounding the settling pond had to be taken down to allow the backhoe access and will have to be replaced in 1989. A rock chute was constructed along both sides of the intake screen to attempt to scour the streambed and address this problem, so far it appears to be working well.

iii) As in 1987 the pipeline between the creek intake and the settling pond became plugged. In this case the pipe became plugged with sand while the backhoe was dredging the pond and the flow from the creek had been stopped. We were able to clear the pipe with the help of a high pressure pumptruck used to clear culverts and septic lines. As a result of this the hatchery was dependant on the the brook and groundwater supplies for a period of three or four days with no ill effects.

iv) Two students were hired through July and August as a result of acquiring funding from the federal Challenge '88 Program. These students were instrumental in our operation during the summer period and allowed us to provide the public with tours of the hatchery.

Operating Plan for 1989/90

As in previous years we will begin releasing the chinook and coho salmon smolts in April and May. The 1987 brood Bulkley River chinook will be the first to go, followed by Bulkley River coho and Toboggan Creek coho. All salmon destined for the Bulkley River will be enumerated and transferred to the portable transport tanks in batches of 6,000 fish. These fish will be transported by 4 wheel drive vehicle and released at all accessible sites between the town of Houston upstream to the Bulkley Falls near Topley. These releases will take the better part of 3 weeks to complete as we have over 175,000 salmon smolts to release.

The 1987 brood Toboggan Creek coho will be released adjacent to the hatchery and upstream wherever access permits. The majority of these smolts will be allowed to migrate on their own from the channel to the creek, the screen at the lower end of the rearing compartments will be removed in mid May.

Hatchery personnel will be responsible for all aspects of the steelhead rearing program in 1989/90. This years operation will be a scaled down version and we will be collecting four female steelhead in April to supply us with 20,000 eggs. Fry will be reared for 12 to 14 months and released into Toboggan Creek during the summer of 1990 at approximately 6.0 grams.

As in 1988 our chinook egg target will be 105,000 eggs from upper Bulkley River broodstock. This will occur from mid to late August and the rearing strategy will be identical to the program in 1988/89.

Coho egg targets will be 130,000 eggs from the same 3 stocks targetted in 1988; Toboggan (40,000), Bulkley (60,000), and Kathlyn (30,000). If, as has been the case in the previous 2 years, we are unable to attain our egg targets for the latter two systems we will take additional coho eggs from Toboggan Creek broodstock for transplant purposes.It is unfortunate to have to resort to this type of enhancement tactic but this is the only avenue left open to this facility because too few upper Skeena coho are being allowed to escape the commercial fisheries'.

We hope to continue with assessment activities initiated last year and will attempt to gain accurate escapement estimates on all the systems we will be working with in 1989.

As well, we will attempt to keep the public in this area as informed as possible of our operations and the state of the salmon and steelhead resources in the Bulkley/Morice system.

Recommendations

Most aspects of our operations in 1988/89 went very well, our egg to fry and fry to release survivals have been excellent, and our smolts are in excellent health at release. There are some areas where I believe changes would be beneficial in improving the success of our efforts:

i) We could definitely benefit from the acquisition of a larger transport tank for release of salmon smolts. At present smolt releases take an inordinate amount of our time because of the small quantities of fish which our present tanks are capable of holding. A tank capable of accomodating 15,000 smolts at 15.0 grams would be very useful, timesaving, and allow us to release a greater portion of these smolts at the peak of natural smolt migration. The lease of a 2 ton truck would also become necessary for a 2 week period.

ii) We appear to be at maximum loading densities for smolt production and I recommend present egg targets of coho and chinook salmon remain at 250,000 green eggs total.

iii) Salmon fry densities in capilano troughs, prior to fin clipping and coded-wire tagging, were at dangerously high levels prior to transfer to the outdoor rearing channel. I recommend the coded-wire tagging crew start marking our 1988 brood salmon no later than August 15, 1989.

iv) Upper Skeena coho stocks enterring the Skeena River in July and August should be allowed maximum protection from commercial interception. If escapements of upper Skeena coho are below levels necessary for maintaining the species the entire Area 4 net fishery should be terminated until such time coho escapement levels are achieved. The upper Skeena stocks are on the verge of extinction and enhancement of these stocks is being hampered by a lack of sufficient broodstock available to hatcheries such as ourselves. I believe the C.E.D.P. should be at the forefront in demanding biologically sound harvest management practices, these fish belong to all the people of Canada not just those holding a licence to kill them!

Since this facility was constructed, and since the Toboggan Creek Salmon and Steelhead Enhancement Society took on the task of operating the hatchery, we have successfully reared and released over 1,000,000 salmon smolts and steelhead fry. These releases should result in adult production of close to 5,000 steelhead, 26,000 coho and 6,000 chinook. If adequate numbers of these species are allowed to escape the numerous commercial fisheries, both targetting and incidental which have been responsible for their decline, then we will indeed have accomplished something of biological and social value.

Again, our society is greatly appreciative for the part we play in enhancing the salmonid resources in our area and for the support we receive from various factions of the Community Economic Development Program and Small Projects Unit of the Department of Fisheries and Oceans. In particular we would like to acknowledge Linda Sullivan, the coordinator for our project, as well as Matt Foy (S.P.U. Biologist) and S.P.U. engineers Russ Doucet and Rheal Finnegan. We feel strongly that C.E.D.P. is of immense benefit to the salmonid resource and to the social well being of the communities it has been involved with!

Cheers, M O'Neill.

Mike O'Neill, Hatchery Manager,
TOBOGGAN CREEK SALMON & STEELHEAD
ENHANCEMENT SOCIETY , R.R. # 1 ,
SMITHERS, B.C., CANADA V0J 2N0
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APPENDIX "A"

Statement of Work - 1988/89

TOBOGGAN CREEK 88/89

TITLE

Continued Development and Operation of the Toboggan Creek Hatchery.

PROJECT

Toboggan Creek Salmonid Enhancement Program.

SCHEDULE B

Part A: Salmon Culture at Toboggan Creek Hatchery

Statement of Work for contract April 1, 1988 - March 31, 1989.

The Contractor agrees to undertake the activities of project management and administration, facility operations, brood stock collection, construction, assessment and training as described below in this Statement of Work.

1.0. PROJECT MANAGEMENT AND ADMINISTRATION

The Contractor or its delegate is required to:

1. Implement the contract in its entirety and ensure that the technical quality of the work activities is maintained at DFO standards. Identify and anticipate problems affecting the Statement of Work and communicate such to the DFO Scientific Authority.

2. Participate in long and short term program planning with the Scientific Authority, Support Biologist and Project Advisor, including:

   - enhancement plans and strategies.
   - facility development.
   - work scheduling.
   - training requirements and annual training plans.
   - labour requirements.
   - budgeting.

3. Develop activity plans and schedule crews to complete the work. Where appropriate, delegate work or specific tasks to the crew. Provide adequate supervision of crews during all project activities and establish appropriate employment work and behaviour standards. Establish emergency and contingency plans and procedures.

4. Manage the contract budget in accordance with the cash flow projections and update the cash flow statement as necessary.

5. Develop budget proposals including labour and budget justifications, labour plan summaries and cash flow projections.

6. Obtain necessary permits and approvals from the appropriate agencies and landowners for instream work, fish transplants, fish collection, trespass and building construction.

7. Order and purchase equipment as required according to the limitations set out in the Basis of Payment. Maintain equipment in operating condition and keep updated equipment inventory lists.

8. Maintain complete, consistent, accurate, timely and well organized records of all aspects of the contract and make these records available at all times.

9. Maintain regular verbal contact with the Scientific Authority to inform and advise her about the progress of the project, special problems, and special support requirements.

10. Prepare and submit training, status, inventory, brood summary, annual and special reports as detailed in Appendix I and as may be required by the Scientific Authority.

11. Submit written, monthly training and activity reports, with each financial claim, to the Scientific Authority. (Payment of financial

claims cannot be authorized without the monthly training and activity reports attached).

12. Submit the annual report with the final financial claim for payment by April 15, 1989. (A penalty of $2,500 will be held back if the annual report is not received with the final claim or is not judged to be satisfactory by the Scientific Authority. These funds may be claimed once the annual report is received and judged satisfactory).

13. Promote community awareness of the project and the Community Economic Development Program.

2.0 FACILITY OPERATIONS

The contractor is required to operate the Hatchery facility in a manner specified by this Statement of Work, the Scientific Authority, and the Project Biologist to ensure the following general criteria are met.

- the fish and/or eggs in the care of the contractor will receive the best possible treatment to obtain maximum quality, health, growth and survival.
- the record keeping associated with every phase of this activity is complete, consistent, well-organized, accurate and available at all times.
- any Crown equipment in the care of the contractor will be maintained in the best possible operating condition and be available for project and departmental use only.

The following activities are to be undertaken as part of the incubation program:

- monitor and record data relevant to the incubation of eggs at the hatchery (i.e., water flow, water temperature, dissolved oxygen, etc.).
- maintain correct water flow to the incubation trays and moist incubators at all times.
- check the pipeline and screen daily and clean debris if necessary.
- record accumulated thermal units (ATU) on a daily basis.
- administer fungus treatment to eggs (up to 350 ATU's) in the incubators as appropriate.
- shock, pick, count and record egg mortalities at the eyed stage.

The following activities are to be conducted as part of the rearing program:

- prepare Capilano troughs for emerging fry. Clean rearing containers thoroughly prior to use. Organize and sterilize all equipment.
- pond all '87 brood at emergence into available rearing containers. Enumerate all fish before transfer and prior to release using standard sub-sampling procedures.
- prepare outdoor ponds for smolt rearing.
- feed all juvenile fish according to the feed rates specified by the manufacturer or by DFO support staff.
- rear fish utilizing standard fish culture techniques. Measure and record water temperature, pH and oxygen levels daily.
- keep accurate records of food rations, fish size, species, mortalities, general fish behaviour, disease, etc.
- maintain fish health and treat fish health problems as directed by DFO support staff. Keep the rearing facility in an organized and sterile condition.
- release fish at the appropriate times as directed by DFO support staff. Clean Capilano troughs and rearing ponds after fish are released.

The following activities for maintenance and improvement of the enhancement project shall be undertaken:

- organize all tools, equipment, and spare parts so that they can be accounted for at all times.

- maintain all emergency and facility equipment in operating condition at all times.
- maintain an operating log for all motorized equipment.
- regularly test back up pumps and test alarm system daily during incubation and rearing at the hatchery.
- maintain tidy and clean grounds surrounding the hatchery including general landscaping.
- improve the channel dividers, clean the channel and widen the channel.
- install a system for diverting waste water from the hatchery past the channel.

2.1. BULKLEY RIVER CHINOOK

1986 Brood Year:

Continue rearing the 122,000 1986 brood year chinook juveniles in the outdoor ponds until they reach 15 grams as 1+ smolts. Release these 15 gram smolts in late April, 1988. Transport these smolts to the Upper Bulkley. Enumerate all fish prior to release using standard sub-sampling procedures. Release the fish in the early evening.

1987 Brood Year:

Continue rearing the 110,000 1987 brood year chinook fry until they reach 15 grams as 1+ smolts. The same release strategy applies in April, 1989 as for the 1986 brood year Bulkley chinook.

1988 Brood Year:

Pond and rear the 1988 brood year Bulkley chinook fry in Capilano troughs in March, 1989.

2.2 TOBOGGAN CREEK COHO

1986 Brood Year:

Continue rearing the 71,000 1986 brood year Toboggan Creek coho smolts to 15 grams in the outdoor channel. Release these smolts in early May, 1988 into Toboggan Creek at the hatchery site.

1987 Brood Year:

Continue incubation of the 43,000 1987 brood year Toboggan Creek coho eggs until April, 1988.

Begin ponding the 43,000 fry at emergence in the Capilano troughs in April, 1988. After tagging these coho transfer them to the outdoor channel. Continue rearing the fry until release in May, 1989.

2.3 UPPER BULKLEY COHO

1987 Brood Year:

Continue incubation of the 50,000 1987 brood year Upper Bulkley coho eggs until April, 1988. Segregate the "pure" stock (12,000) Upper Bulkley fry at emergence by ponding them into a single Capilano trough. Pond the "mixed" stock (38,000) Upper Bulkley/Toboggan Creek fry into a separate Capilano trough. Continue rearing the fry separately until they can be coded wire tagged and transferred to the outdoor ponds. Continue rearing the fry until release in May, 1989.

2.4 CHICKEN CREEK COHO

1987 Brood Year:

Continue incubation of the 24,000 1987 brood year Chicken Creek coho eggs until April, 1988. Begin ponding the fry at emergence in the Capilano troughs in April. Continue rearing the fry until release in May, 1989.

3.0. BROOD STOCK COLLECTION

The contractor is required to collect and record all pertinent information such as fish numbers, size, sex, scale samples with lengths, numbers of fish killed, average fecundity, etc. on the forms provided and summarize this data in monthly reports.

To provide for fish capture the contractor will be required to ready all capture equipment, repair and assemble all holding facilities, prepare the incubation facility for the eggs and accumulate all necessary data sheets.

The local fisheries officer must be informed of the initiation, progress and termination of the coho and chinook brood stock collection.

3.1 1988 BROOD BULKLEY RIVER CHINOOK

- collect approximately 120,000 chinook eggs from the Bulkley River in August, 1988.

- incubate the eggs in the "moist" incubators at the hatchery to the "eyed stage" (approx. 350 ATU's). When the eggs are all thoroughly eyed, shock and pick the dead eggs. Count and transfer live eggs to the vertical incubators to complete incubation.

3.2 1988 BROOD TOBOGGAN CREEK COHO

Collect 40,000 1988 brood year Toboggan Creek coho eggs from the early run (expected in September or October, 1988). The fry from these eggs will be coded wire tagged in the summer of 1989 and released into Toboggan Creek in May, 1990.

Capture and hold enough broodstock to yield an additional 85,000 1988 brood year Toboggan Creek coho eggs to be used to fill the hatchery only if coho adults cannot be collected from the upriver sites (Chicken, and Upper Bulkley).

Incubate the eggs in the "moist" incubators at the hatchery to the "eyed stage" (approx. 220 ATUs). When the eggs are all thoroughly eyed, shock and pick the dead eggs. Count and transfer live eggs to the vertical incubators to complete incubation.

3.3 1988 BROOD CHICKEN CREEK AND UPPER BULKLEY COHO

- Coordinate broodstock collection efforts with the local Public Involvement Project (through the Community Advisor) to operate the fence on the Upper Bulkley in the same way as undertaken in 1987.

- Construct and install adult traps in early September, 1988 at appropriate locations on Chicken Creek and the Upper Bulkley River. Monitor and maintain the traps daily.

- Collect sufficient adults to yield the following egg take targets:

a)	Chicken Creek	25,000
c)	Upper Bulkley River	60,000

- Hold the adults for ripening in safe, secure locations as approved by the Support Biologist, Matt Foy. Update the Smithers Fishery Office (T. Turnbull or L. Dane) frequently on catch and holding locations.

- Transport green eggs and sperm to the hatchery for fertilization and incubation.

- Incubate the eggs in the "moist" incubators at the hatchery to the "eyed" stage (approx. 220 ATUs). When the eggs are all thoroughly eyed, shock and pick the dead eyes. Count and transfer live eggs to the vertical incubators to complete incubation.

4.0 ASSESSMENT

The contractor is required to undertake coded wire tagging of chinook and coho juvenile salmon at the hatchery and may also be required to fin clip 1986 brood Toboggan Creek coho.

4.1 CODED-WIRE TAGGING

- prepare to coded wire tag 30,000 1987 brood Bulkley chinook juveniles in September, 1988. Clip the adipose fin under the direct supervision of Streamline Consulting. Streamline Consulting will supply all tagging equipment and taggers.
- prepare to coded wire tag and adipose clip 30,000 1987 brood Toboggan Creek coho juveniles, probably just after the 1987 brood chinook tagging is complete. Streamline Consulting will again supply all tagging equipment and taggers.

- prepare to coded wire tag all the Upper Bulkley coho juveniles in September 1988. The "pure" group of 12,000 will be marked with adipose/left ventral fin clips. A second group of mixed Upper Bulkley/Toboggan Creek stock (12,000) will be marked with adipose/right ventral fin clips. A third group of mixed Upper Bulkley/Toboggan Creek stock (12,000) will be marked with an adipose only fin clip. The remainder of the Upper Bulkley/Toboggan Creek will be marked with an adipose only fin clip. Each of the four groups will receive separate tag codes.

  NOTE:
  This strategy must be confirmed with Ron Kadowaki before tagging takes place.

- release these tagged juvenile chinook and coho in April/May, 1989.

4.2 FIN CLIPPING

- If hatchery operations are not disrupted and no extra labour is expended, any remaining untagged 1987 brood coho juveniles destined for release in Toboggan Creek may be marked with a fin clip. The appropriate fin to clip and this effort are to be approved by Support Biologist, Matt Foy.

5.0 TRAINING

Provision is made in this contract to enable regular hatchery personnel to receive on-site instruction and training related to the successful implementation of the contract. This training will be delivered by the Project Advisor and on occasion, as required, by a specialist in the appropriate discipline. The Project Advisor will conduct a series of mini-workshops on all aspects of the contract.

Funds and project time have been allocated for the Project Manager to receive significant training in Project Management and Computer Use and for the Foreman to receive significant training in Project Management and Enhancement Rationale. In addition, the Project Manager should maintain records showing all training completed and further training required for each employee.

6.0 STATUTORY HOLIDAYS

Provision is made in this contract for hatchery personnel to be reimbursed as a direct contractual expense for legitimate statutory holidays as identified in the B.C. Labour Code guidelines.

Explanatory Notes:

Estimated Labour Requirements

The labour estimates for all the activities outlined in this contract are based on the information provided in Appendix II attached.

Project Advisor and Special Technical Assistance

A part-time Project Advisor will continue to be assigned to the project as required to provide biological, technical and managerial on-site training and advice as needed in order to assist the contractor in fulfilling its contractual obligations to the satisfaction of the Scientific Authority. The project advisor is not responsible for directing the crew or ensuring the satisfactory completion of activities; this is the sole responsibility of the contractor and its delegates.

Engineering and extra biological advice beyond the scope of the Project Advisor will be provided by the Small Project's support staff when appropriate as determined through consultation with the Project Manager, the Project Advisor and the Scientific Authority.