ANNUAL REPORT FOR TOBOGGAN CREEK HATCHERY OPERATIONS IN 1992/93

Toboggan Creek Salmon and Steelhead
Enhancement Society

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Introduction

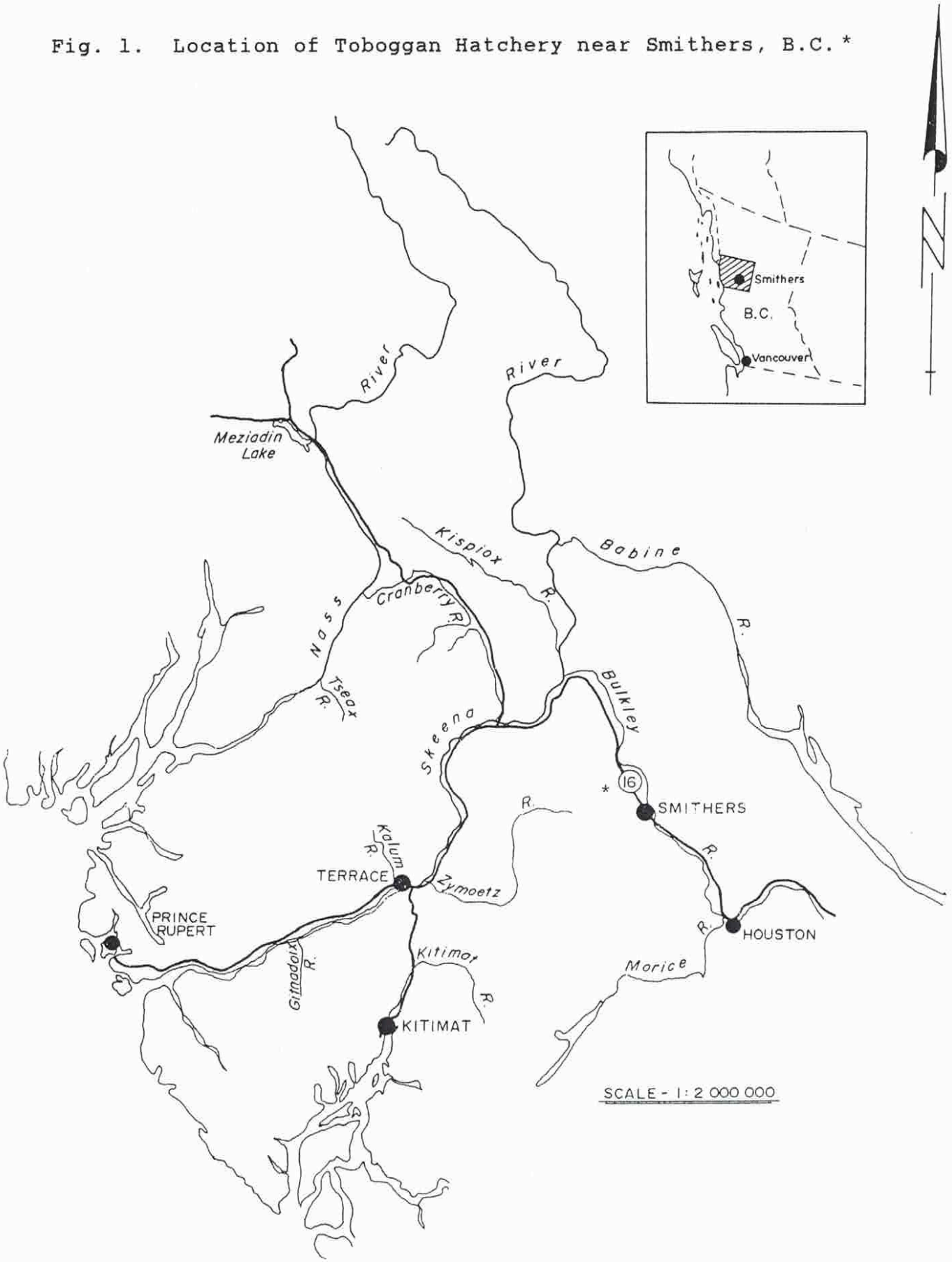
The Toboggan Creek Hatchery, under the direction of the Toboggan Creek Salmon and Steelhead Enhancement Society, just completed its eighth successful year of operation. The Toboggan Hatchery operations are located 13 kilometers north-northwest of Smithers, British Columbia on Highway 16 West (Fig. 1). They are 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 federal Department of Fisheries and Oceans and its Community Programs Division of the 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 and native Indian food fisheries. Some coho stocks; those specifically from Bulkley, Morice and upper Skeena rivers; have had dangerously low escapements to them in recent years. This was particularly evident in both 1991 and 1992 on the entire Bulkley and Morice system. Collection of our adult coho broodstock was hampered by low escapements to some of the tributary streams in this watershed.

The Toboggan Creek facility, constructed in 1984/85, has been attempting to preserve and enhance endangered stocks of the three aforementioned species. During the 1992/93 contract period our society reared and released 110,000 coho and 52,000 chinook salmon smolts from the 1990 brood year, our steelhead efforts have since been discontinued. Also, successful rearing of over 105,000 chinook and coho salmon from the 1991 brood continued, these stocks are now scheduled for release in the spring of 1993.

Egg targets of 1992 brood chinook salmon from the Bulkley River were easily met and at present we have approximately 90,000 fry ponded and feeding. Escapements of chinook were good in 1992 and the upper Bulkley River had between 1,300 and 1,400 spawners return to the system. Over one half of the escapement were clipped hatchery returns from 1986 and 1987 brood releases.

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



Coho returns to the upper Skeena tributaries in 1992 were extremely poor for unenhanced systems, and moderately better for enhanced runs. Poor runs, combined with excessive harvest levels in both the saltwater and freshwater fisheries ensured that very few coho made it to their spawning beds in the fall of 1992. Escapements to Toboggan Creek were poor, but allowed us to collect 40,000 eggs in 1991. As well, 55,000 coho eggs were collected from coho spawners in the upper Bulkley River system in 1992. The run to this river was very poor but with the coho counting fence on the Bulkley, manned by members of the Houston Steelhead Society, we were able to capture enough wild females to attain our egg target this year.

The Toboggan Creek Hatchery has the capacity to rear 155,000 coho and chinook salmon smolts from the Bulkley River system on a yearly basis. Initial incubation is accomplished using moist incubators and eggs are transferred to Heath stacks 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 way 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 to the ocean. Ponding to release survivals usually exceed 95.0 %, a period of 12 months. Two full-time personnel are required to operate the facilty and extra manpower is hired during the summer months.

The coho counting fence panels were installed on August sixth this year. This enabled an accurate assessment of our fifth major return of hatchery-produced coho to Toboggan Creek. The fence data indicated hatchery returns of 176 marked coho in 1992, from a release of 31,607 smolts this is a 0.6 % return. Preliminary coded-wire tag data from the northern troll and net fisheries indicate heavy exploitation of this stock after they reach the adult stage. The data indicates a total adult recruitment of approximately 516 coho from this release, only 1.6 %. Given these low smolt to adult survivals a 66.0 % rate of exploitation may be much too high to maintain upper Skeena river coho stocks. Total escapement was 2,200 coho this year.

Approximately 10.0 % of the coho run in 1992 were fin-clipped fish of hatchery origin, many of the remainder were probably second generation hatchery coho from the 1988 spawn. There is evidence to suggest that upper Skeena coho are predominantly four year olds.

Our hatchery facility is frequented by over 2,000 visitors on a yearly basis and our Society encourages the public to learn more about the salmonid resource in British Columbia. Members of the Toboggan Creek Salmon & Steelhead Enhancement Society greatly appreciate the opportunity to be involved with these efforts to enhance and protect the wild salmon stocks of 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 coded - wire tagged groups of salmon from Bulkley - Morice stocks to aid in identifying the movements, timing and exploitation of these fish through the various commercial fisheries.

iii) assess returns of hatchery produced salmon to the stream of origin to determine escapement of adult spawners and therefore aid in identifying smolt to adult survivals and total exploitation rates.

iv) maintain a high public profile of the facility to inform the local population of the benefits and goals of the Community Involvement and Salmonid Enhancement Programs.

v) provide employment and training for local school students in the Bulkley Valley area.

vi) develop a core of qualified local people that can be depended upon to accomplish the various goals and objectives with respect to progressive fish culture in the upper Bulkley - Morice drainages.

Water Supplies (1992/93)

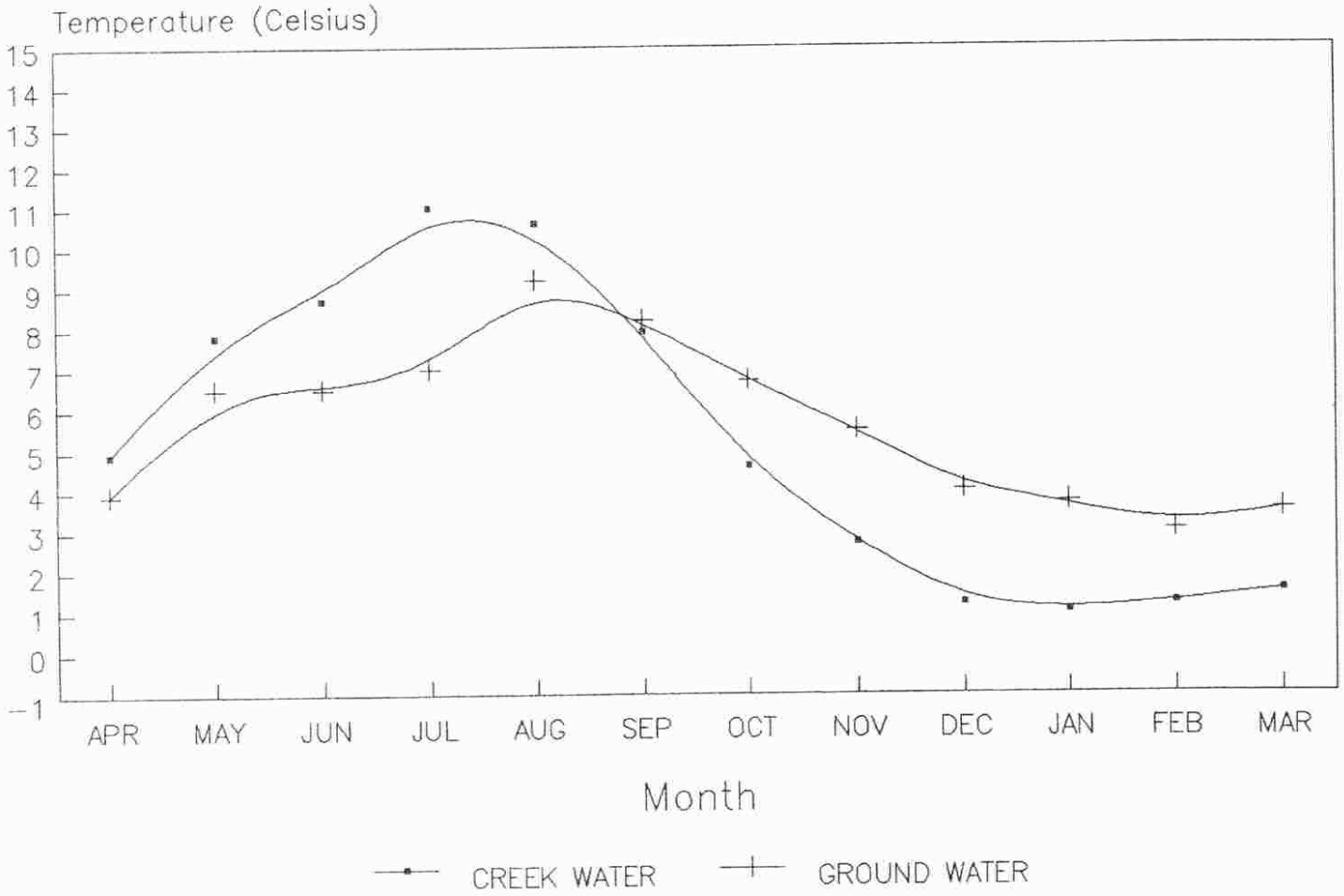
As in the previous seven years, average daily temperatures of the three hatchery water sources were recorded and average weekly temperatures have been calculated. We depend on two of the water sources for egg incubation and fish rearing, ground water from an underground collection system and surface water from Toboggan Creek. The third water supply, surface water of Brandt Brook, is used solely in emergency situations when the main creek supply is not operable. These three water supplies have proven very dependable over the years and we have never experienced a fish loss due to an interruption of flow.

The creek water supply is used for year-round rearing and has a maximum flow of approximately 4,500 litres per minute, the normal operating flow is 1,600 to 1,800 litres per minute. In most cases the creek supply is also used for egg incubation, the exception being during periods of silty runoff flow when the ground water supply is utilized. In cases where we would like to manipulate egg development the ground water supply is used, as it is warmer in the winter period and colder during the spring and summer. The ground water supply has a maximum flow of 100 to 150 litres per minute and is used solely for incubation purposes

Average temperatures in 1992/93 were similar to past years in most months. The creek temperatures declined fairly rapidly in the fall this year as compared to other years due to cool atmospheric conditions at that time but generally the profile was normal (Fig. 2). On average the creek supply fluctuates between 1.0 and 12.0 degrees celsius and the ground supply is from 3.5 to 8.0 degrees celsius on a monthly basis.

Water levels and flows were stable overall in the spring and summer of 1992, due in part to the fact that Toboggan Creek is glacier fed. Extremely dry atmospheric conditions from the first of May through to mid September left most streams close to drying up, many small tributaries did run dry. The melting ice kept Toboggan Creek flows up during this period of very low precipitation. As in 1991 we experienced a strong freshet in the fall of 1992, in late September and early October. The rain continued through the late fall period resulting in good flows right into the winter.

Fig.2 Rearing Temperatures
at Toboggan Creek Hatchery (1992/93)



TOBOGGAN CREEK HATCHERY - SALMON BROOD YEAR SUMMARIES

Bulkley River Chinook (1990 brood)

Releases of the 1990 brood chinook smolts commenced April 13 and were completed April 22, 1992. A total of 51,857 chinook smolts were transported in batches of 3,500 fish to the upper Bulkley River near Houston, B.C. These smolts averaged 15.6 grams in weight. Due to the high spring runoff conditions we released the majority of these smolts at the McQuarrie Creek groundwater channel adjacent to the main river, the remainder were planted in the mainstem Bulkley and its tributaries both upstream and downstream of this point. An additional 8,700 chinook from this brood year were released, as fed fry, prior to this. These fry averaged 9.0 grams at release, and all of these salmon were left-ventral clipped for future assessment. All of the fry were released on November 4th and 5th, 1991 in the upper Bulkley River, above the falls. Locations of smolt releases are as follows:

Topley road crossing	11,940
McQuarrie groundwater area	32,687
Knockholt road crossing	7,230
Total Released	51,857

Releases took only six work days to complete this year and we had two crews and vehicles working, a total of 15 individual trips were required. Everything went very well on all of the releases and we observed only 17 mortalities in total. As was the case in previous years we kept the densities in transport at lower levels during the afternoon trips due to the higher water temperatures and related stress. Green egg to release survivals of this stock were 92.5 % over a 20 month period.

This stock was enumerated prior to release by using standard subsampling techniques. Results of this enumeration verified that our book estimates were accurate and indicated predation was not a factor in the outdoor channel this past year.

Bulkley River Chinook (1991 brood)

Ponding of the 1991 brood Bulkley River chinook fry began on February 14th and finished on February 27th, 1992. These 0.43 gram fry were ponded in one Capilano trough and feeding was initiated using #2 Biodiet starter. A total of 62,594 salmon fry were ponded and initial survivals were excellent. Green egg to ponding survivals were 96.8 %.

Growth of the 1991 brood Bulkley River chinook fry increased rapidly, commencing in mid April, in conjunction with warming water temperatures and these fish continued to grow rapidly through the summer period (Fig. 3). Rate of growth in 1992/93 was similar to past years and dropped off quickly during the winter period as a result of cold temperatures and a reduced feeding schedule. At the present time these Bulkley River chinook smolts average 10.0 grams in weight, we hope to have them at 11.0 to 12.0 grams prior to release in April of 1993.

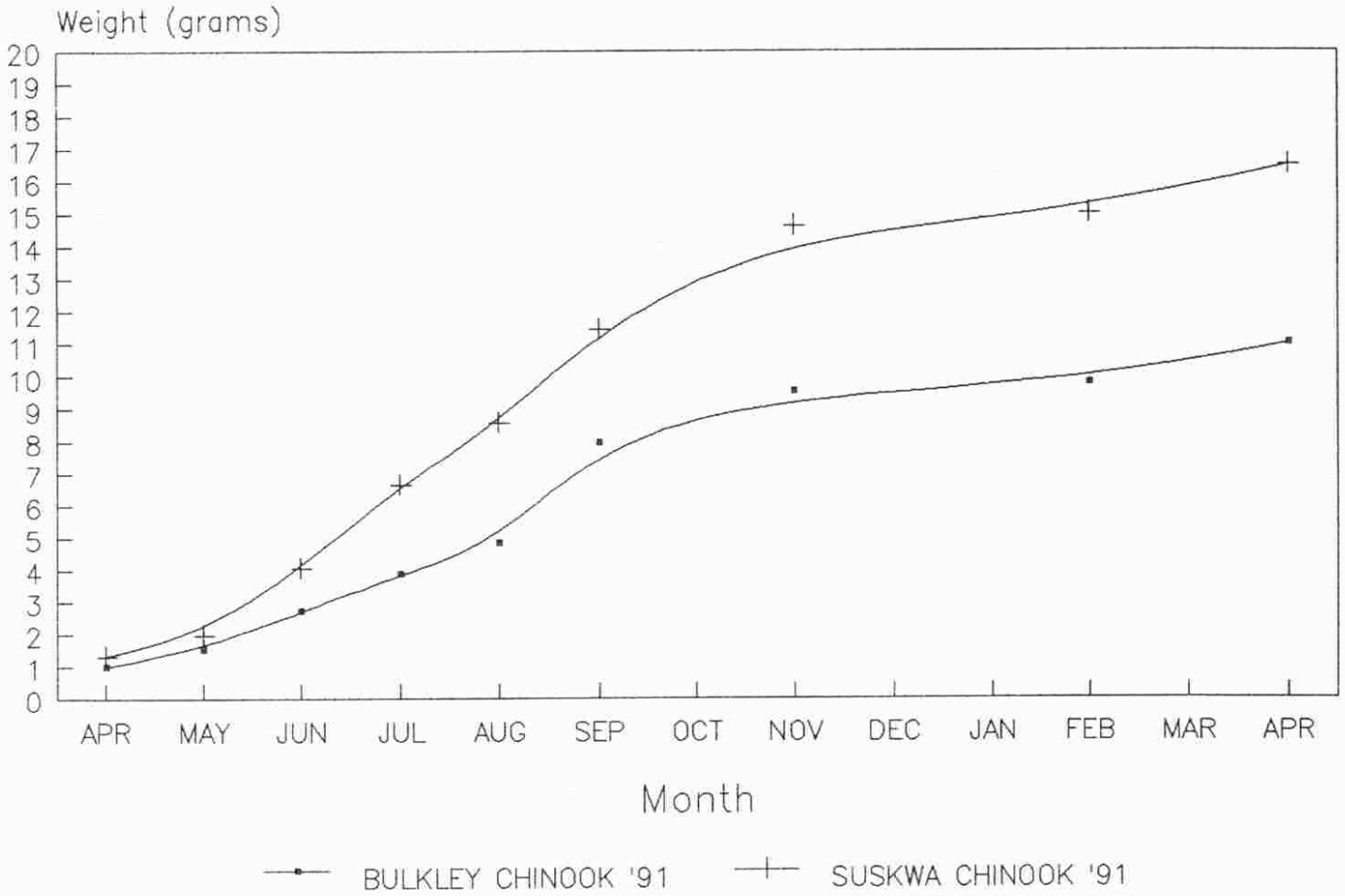
These chinook fry were split into 2 Capilano troughs in late April and divided again into 3 troughs in May when loading densities reached 22.0 kilograms per cubic meter. We had a problem with pseudomonas bacterial infection early in ponding and lost approximately 3,000 fish as a result, this infection is apparently untreatable. Densities just prior to coded-wire tagging were kept at acceptable levels in 1992 as a result of the cancellation of the Bulkley coho program for 1991 and the timing of Thyra Nicholl's tagging crew.

Coded-wire tagging occurred between June 28 and July 1, 1992. All of these coded-wire tagged chinook fry were transferred to compartment "A" of the rearing channel shortly afterwards. Survivals during tagging were excellent as usual and a total of 52,037 chinook were tagged, tag loss was less than 0.5 %. Ventral clipping of the 1991 brood chinook surplus to the tag group was completed in July. Exactly 6,940 chinook were right - ventral clipped, this was 4,131 more than we had originally estimated. All of these surplus chinook were released in mid September, at 8.0 grams, upstream of the Bulkley River falls.

Data Code	Total Tagged	Fin Clip
18-05-31	26,061	ad/r.v.
18-05-32	25,976	ad/r.v.

Survivals since ponding have been excellent and presently are over 94.0 %, green egg to release survivals may exceed 90.0%. At present we have over 51,900 Bulkley chinook remaining.

Fig.3 Growth of Chinook Salmon at Toboggan Creek Hatchery (1992/93)



Suskwa River Chinook (1991 brood)

Work with the Suskwa River chinook stock began in the fall of 1991 when approximately 8,300 eggs were collected for a local Public Involvement Program project. These eggs were scheduled to be transferred to an incubation box at the eyed stage, the incubation box was to be located in a groundwater area along the Suskwa River. Due to logistical problems at the site this transfer did not occur and we inherited this stock.

Due to the cancellation of the Bulkley coho program for 1991 we ended up with sufficient rearing space to keep these fish to smolt size. Fry from this stock were ponded in February of 1992 at 0.56 grams and grew rapidly throughout the spring and summer period (Fig. 3), at the present time they average 15.0 grams in weight. These fish were ventral clipped as fry.

Survivals have been excellent and we still have over 8,000 of these smolts rearing in the outdoor channel. Releases of this stock back into the Suskwa are scheduled for April of 1993. Green egg to release survivals should be over 96.0 %.

Suskwa River Chinook (1992 brood)

Approximately 10,200 chinook eggs were collected from Suskwa River broodstock in August of 1992. These eggs were incubated in a moist incubator tray and transferred to two Heath trays at eyed stage, survivals during shocking and picking were excellent (Table I) and we recently ponded over 10,000 fry in early February. Feeding has been initiated and this stock is doing well.

Due to the fact that the hatchery will be at capacity in 1993 we will be releasing these fish as fed fry, unless we find an alternate rearing site for the summer period.

Table I. Shocking and Picking Summary for 1992 Brood Suskwa River Chinook Salmon Eggs at Toboggan Creek Hatchery.

Tray #	1	2	Total
Pre-Shock Mortalities	4	8	12
Post-Shock Mortalities	65	98	163
Volume (mls)	2500	2550	5050
50 ml sample	100	102	101
Eggs / ml	2.00	2.04	2.02
# Incubated	5,006	5,215	10,221
# Remaining	4,937	5,109	10,046
% Survival	98.6 %	98.0 %	98.3 %

Bulkley River Chinook (1992 brood)

Broodstock collection of the 1992 brood chinook from the upper Bulkley River commenced on August 17th of 1992 and by August 25th we had attained our egg target of 100,000 eggs.

Due to the very dry atmospheric conditions during the months of July and August the upper Bulkley River was extremely low during the chinook spawning period. Very few salmon accessed the mid to upper reaches of the system. Migration of chinook from the holding pools to the spawning areas proved difficult and many fish were stranded trying to get up the riffles. The spawning fish were extremely vulnerable to predation as well. Through a concerted effort by hatchery staff, local members of the Houston Steelhead Society, D.F.O. guardian Sam Wright, and a few other concerned individuals we were able to create migration channels through the riffle areas and keep beaver dams open in the areas of heavy chinook concentration.

Eggs were collected from 23 female chinook, 5 of which were partially spawned. Brood females averaged 26.5 inches hypural length and weighed 15.0 pounds. Milt was expressed from 29 male chinook during the course of the egg takes and eggs from each female were fertilized with the sperm from 2 different males, some males were used for more than one female and all males were released after expression. Scale samples have been taken from 45 chinook and sent to the Biological Station for analysis. Also, heads were taken from 48 spawned-out salmon for coded-wire tag dissection.

With funding from D.F.O.'s Assessment Branch we were able to do two helicopter surveys of the upper Bulkley River in 1992. Observations made during these flights are as follows:

		Aug. 17	Aug. 27
above Bulkley Falls	-	0 chinook	not flown
Meanwhile Creek	-	0 chinook	not flown
Topley	-	0 chinook	not flown
Richfield Creek	-	2 chinook	4 chinook
Perow Station	-	0 chinook	0 chinook
McQuarrie Creek	-	0 chinook	0 chinook
below McQuarrie Creek	-	192 chinook	135 chinook
below Knockholt	-	85 chinook	124 chinook
Houston	-	852 chinook	850 chinook
Total observed / flight	-	1,131 chinook	1,113 chinook

From these observations and from previous year's experiences I would estimate the chinook escapement to the upper Bulkley River to be between 1,300 and 1,400 adults in 1992. The run was dominated by 5 year old chinook from the 1987 brood, with very few chinook of the other age classes showing up at all. We sampled 515 chinook during broodstock collection and found that 264 were hatchery clipped returns (51.3 %), with 1987 brood fish making up over 90.0 % of this escapement.

Warm water temperatures were again evidenced in 1992 with the extreme temperatures reaching 21.0 degrees Celcius. This, in conjunction with the very low flows, put severe stress on the chinook spawners in the upper Bulkley River this fall. Peak spawning was consistent with the timimg of past years.

These events along with the population estimates and the egg take results have been documented and were submitted to the D.F.O. office in Smithers at the conclusion of fieldwork.

All of the eggs collected in 1992 were taken in the field and transported to the hatchery prior to fertilization. After the eggs were fertilized they were disinfected and water hardened for one hour before being placed in the moist incubators for initial incubation purposes.

Shocking and picking of the 1992 brood Bulkley River chinook eggs was finished on October 06, 1992 at 280.0 A.T.U.'s. At this time the chinook eggs were transferred to Heath trays to hatch. Overall survivals to eyed stage were good and averaged 98.0 % (Table II). Volume estimates at eyed stage verified our spawning estimate of close to 100,000 eggs collected.

Development this year was more advanced than in past years and ponding of this stock occurred in February of 1993. Good survivals were evidenced during hatch and ponding and we now have approximately 98,000 fry remaining.

Table II. Shocking and Picking Summary for 1992 Brood Bulkley River Chinook Salmon Eggs at Toboggan Creek Hatchery.

Tray#	Pre-shock	Post-shock	50 ml	Volume(mls)	Survival
M1-2	31	138	128(2.56)	4080	10307(98.4)
M1-3	55	271	132(2.64)	3730	9576(96.7)
M1-4	5	16	139(2.77)	3850	10649(99.8)
M1-5	56	210	107(2.14)	3990	8329(96.9)
M1-6	28	74	144(2.88)	3860	11043(99.1)
SubTot	175(0.3%)	709(1.4%)	130(2.60)	19510	49904(98.3%)
M2-2	106	484	109(2.18)	3800	7800(93.0)
M2-3	26	109	114(2.28)	3610	8122(98.4)
M2-4	31	105	123(2.46)	3280	7964(98.3)
M2-5	10	45	125(2.50)	3370	8380(99.3)
M2-6	34	91	124(2.48)	3420	8391(98.5)
M2-7	17	83	124(2.48)	3710	9118(98.9)
SubTot	224(0.4%)	917(1.8%)	120(2.40)	21190	49775(97.8%)
Totals	399(0.4%)	1626(1.6%)	125(2.50)	40700	99679(98.0%)

Chinook Hatchery Returns (1986,1987 and 1988 broods)

Marked hatchery returns again made up the majority of chinook escapement to the upper Bulkley River this year, an estimated 718 finclipped chinook and 682 wild chinook returned to this system in 1992.

These escapement estimates were determined as a result of the intensive assessment carried out by hatchery staff in 1992, and with additional funding from D.F.O. biologists. The extra funding facilitated two helicopter surveys of salmon spawning grounds on the upper Bulkley in mid to late August. These two flights indicated a spawning escapement of 1,400 chinook for the Bulkley system.

A total of 515 different chinook were randomly sampled during and after broodstock collection by hatchery staff, the sample represented over 35.0 % of the total estimated escapement. As a result of this sampling we determined that 51.3 % of the run was of hatchery origin. Left-ventral clips from the 1987 brood comprised 96.2 % of the ventral-clipped returns while right-ventral clips from the 1986 brood made up 3.8 %. These numbers are similar to the information gathered from chinook heads collected and dissected for coded-wire tag information. A total of 48 chinook heads were collected, and 44 were found to carry pins:

# of Chinook	Tag Code	Brood Year
1	02/63/13	1988
1	02/63/15	1988
12	02/48/28	1987
6	02/48/33	1987
17	02/48/40	1987
2	02/48/29	1986
4	02/48/30	1986
1	02/48/31	1986

This coded-wire tag data indicates that escapement of adult chinook to the upper Bulkley in 1992 was predominantly 5 year old fish, making up 79.5 % of the adipose-clipped return. The 6 year old fish made up 16.0 % and 4 year olds 4.5 %. We saw very few 3 year old chinook this year.

Based on this years data it appears that we had over 260 fish return from adipose-clipped releases of 1987 and 1986 brood chinook, this represents smolt to spawner survivals of 0.68 % and 0.14 % for the 5 and 6 year age classes respectively.

Bulkley River Coho (1990 Brood)

Releases of 1990 brood coho smolts to the Bulkley River began April 24th and were completed on May 4th, 1992. A total of 50,378 coho smolts were transported in batches of 5,000 fish to the upper Bulkley River, approximately 80 kilometers east of the hatchery on Highway 16. These smolts averaged 13.40 grams at release and had a condition coefficient of 1.11. Due to high runoff flows all of these smolts were released at the McQuarrie Creek groundwater site. Only 6 mortalities were observed during releases and overall survivals of this stock surpassed 95.0 % from green egg to release, a period of over 18 months.

Of the coho smolts released into the Bulkey River this spring 28,212 were coded-wire tagged and adipose-clipped fish, the remaining 22,166 were left-ventral clipped. As a result of flooding in the fall of 1991 it is not known what proportion of the adipose clips are actually from the Bulkley tag group. The Bulkley and Toboggan coho smolts became mixed together as a result of floodwaters overtopping the channel dividers and allowing free movement of fish between compartments. As well, it is estimated that some of the Bulkley coded-wire tags and most of the ventral clips escaped into Toboggan Creek at the time of the flood, approximately 28,000 fish in total.

Toboggan Creek Coho (1990 brood)

The 1990 brood Toboggan Creek coho smolts continued rearing in the outdoor channel until May 19th, 1992 when the screen at the rear of the channel was removed and they were allowed to migrate out. This release coincided with the commencement of the major spring freshet and migration of wild smolts from the system. Peak outmigration occurred on May 24th and all of the smolts had left by May 26th, 1991. These smolts averaged 15.40 grams in weight and had a condition coefficient of 1.13 at release. Approximately 30,926 coho smolts were released; all were coded-wire tagged and adipose clipped but, as with the Bulkley coho stock, it is not known what proportion were actually from the Toboggan tag codes because of the flood.

In addition to these smolts, approximately 14,879 coho were transplanted into Kathlyn Creek on April 23rd and 24th, 1992. These Toboggan Creek coho smolts averaged 14.20 grams in weight, had a condition coefficient of 1.23 at release, and were surplus to the coded-wire tag requirements for Toboggan Creek. These coho were all right-ventral clipped as fry.

Survivals from green egg to release were 95.3 % in the period of 18 months from egg take to smolt release.

Toboggan Creek Coho (1991 brood)

Ponding of the 1991 brood Toboggan Creek coho occurred from March 21st to April 22nd, 1992. A total of 51,122 coho were ponded in two Capilano troughs having taken 695.0 A.T.U.'s to reach swim-up stage. Survivals to ponding were 82.9 %.

Average size at ponding was 0.35 grams and we initiated their feeding with #2 Biodiet starter, the water temperature at the time averaged 3.0 degrees Celsius and these fry got onto the feed reasonably well. Growth of this stock was good from May through October (Fig. 4) although not as rapid as in previous years. Going into the winter period these coho were 8.5 grams in weight. At the present time the Toboggan Creek coho smolts average 10.0 grams in weight, we hope to have them at 13.0 to 14.0 grams prior to release in late May of 1993.

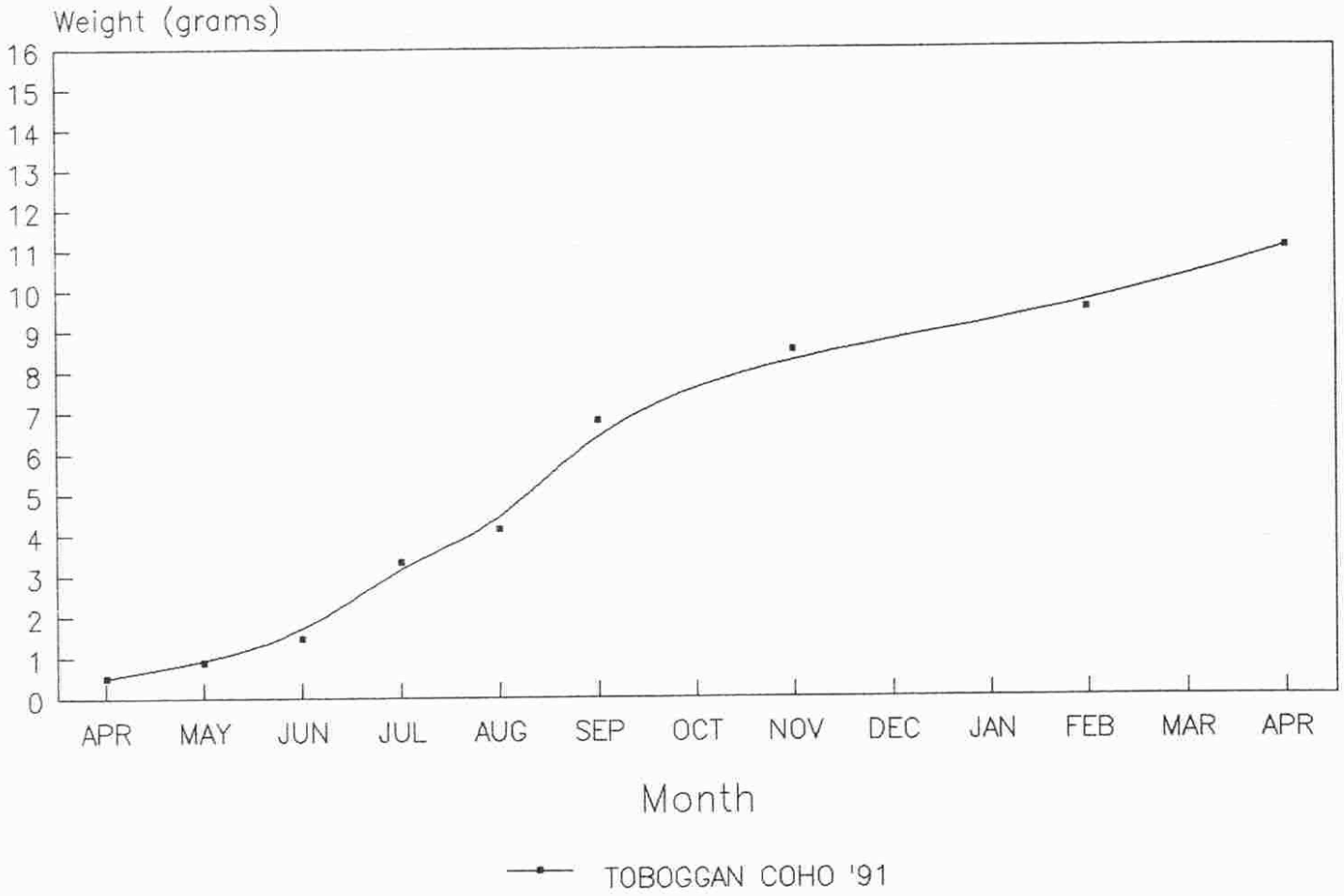
These coho fry were split into 3 capilano troughs in mid July and divided again into 4 troughs in August, just prior to the tagging crews arrival. We experienced some problems with this stock during initial rearing, mortalities due to a bacterial gill infection and an adverse reaction to treatment accounted for 5,500 fish. On the postive side we did not see any signs of myxobacterial infection in this stock in 1992.

Coded-wire tagging of this stock was completed on August 25th and 26th, 1992 when 33,489 Toboggan Creek coho were tagged and adipose clipped. All of the remaining Toboggan coho which were in excess to this were right-ventral clipped and will be transplanted into Kathlyn Creek. The coded-wire tagged group were transferred to compartment "D" of the rearing channel where they continue to rear.

Tag code	# Tagged
02/12/32	11,295
02/12/33	11,374
02/12/34	10,820
Total Tagged	33,489

Survivals of this stock since tagging have been excellent and we expect to release over 33,000 coded-wire tags this May.

Fig.4 Growth of Coho Salmon
at Toboggan Creek Hatchery (1992/93)



Coho Egg Collection (1992 brood)

Coho egg targets over the past few years have included such stocks as Toboggan Creek, Bulkley River and Morice River. The Morice River coho enhancement program was discontinued this year after three years of smolt production. The Bulkley stock is enhanced most years, depending on abundance of wild adult broodstock. The Toboggan stock has been enhanced yearly since we commenced operations in 1985. Coho egg targets for 1992/93 were as follows :

Kathlyn Creek	13,000
Toboggan Creek	37,000
Bulkley River	50,000
Total Egg Target	100,000

Kathlyn Creek Coho (1992 brood)

As in previous years no coho eggs were collected from Kathlyn Creek in 1992 due to nonexistent escapements of wild coho to this creek and, subsequently, a lack of wild genetic stock.

Escapements of hatchery produced coho to Kathlyn Creek have been good the past few years with adult coho returning in the hundreds. An accurate assessment of these returns hasn't been possible to date due to other priorities.

This stream will again be the recipient of a coho transplant from wild Toboggan Creek broodstock, as has been the case for the past six years.

Toboggan Creek Coho (1992 brood)

On October 1, 1992 we collected a total of 11 female coho at the fence on Toboggan Creek. These coho were transported back to the hatchery where they were held for ripening. Eggs were taken on four different dates from 8 females captured at the fence and additional broodstock was collected off the redds between October 14th and October 26th. In total 51 adult coho were collected for broodstock purposes in 1992.

Eggs were taken from a total of 17 ripe female coho and sperm was taken from 31 males. Each female's eggs were fertilized by using at least 2 different males and all eggs were water hardened and disinfected prior to initial incubation in the moist incubators. Scales, weights and lengths were taken from most of the brood females. Average weight was 9.3 lbs and the average length was 21.6 inches. The scales have recently been sent to the lab for analysis.

Shocking and picking of the 1992 brood Toboggan Creek coho eggs began on November 27, 1992 and the last tray was done on December 15th. Survivals to eyed stage were excellent and a total of 40,572 eggs survived to this stage (Table III). The expected ponding date of this stock will be in early April. These numbers do not include the eggs of three females that were diagnosed as carriers of Bacterial Kidney Disease, all of the female coho used for broodstock were screened for this disease in 1992. Samples were sent to the Pacific Biological Station for analysis and each female's eggs were incubated seperately so that we could remove any affected eggs.

Coho from these egg takes will be reared at the hatchery to a size of 15.0 grams and released as smolts in May of 1994. The majority of these fish will be released into Toboggan Creek, the remaining 10,000 being transplanted into Kathlyn Creek as insufficient broodstock were available there in 1992.

Table III. Shocking & Picking Summary of 1992 Brood Toboggan Creek Coho Salmon Eggs at Toboggan Creek Hatchery.

Tray #	# of Females	Pre-Shock	Post-Shock	50 ml Sample	Volume (mls)	Survival (%)
M1-3	2.0	20	33	181(3.6)	1370	4899(98.9)
M2-3	1.0	21	60	153(3.1)	950	2885(97.3)
M2-4	4.0	204	529	158(3.2)	3560	10863(93.7)
M2-5	3.0	124	344	165(3.3)	3020	9722(96.4)
M2-6	3.0	242	702	163(3.3)	2850	8703(90.2)
M2-7	1.0	44	196	166(3.3)	1120	3500(93.6)
Total	14.0	655(1.5%)	1864(4.3%)	164(3.3)	12870	40572(94.2%)

Bulkley River Coho (1992 brood)

A total of 34 coho were collected at the Bulkley coho fence and transported to the hatchery between October 1 and October 12, 1992. These fish were held in covered Capilano troughs in the hatchery until the final egg take on October 26, 1992 at which time the surplus females and remaining males were taken back to the Bulkley and released. All of the adult coho which were used for broodstock were unmarked fish.

Eggs were taken from a total of 20 ripe female coho and sperm was taken from 12 males. Each female's eggs were fertilized by using at least 2 different males and all eggs were water hardened and disinfected prior to initial incubation in the moist incubators. Scales, weights and lengths were taken from all of the females and they averaged 8.6 pounds in weight and 21.8 inches in length. The scales have been sent to the lab for analysis.

Shocking and picking for 1992 brood Bulkley coho eggs began on November 27, 1992 and was completed by December 16, 1992. Survivals to the eyed stage were nearly 97.0 % (Table IV), a total of 53,183 eyed eggs are now incubating in heath stacks. As with the Toboggan stock, these figures do not include the eggs from three female coho that tested positive for B.K.D.

Coho from these egg takes will be reared to 15.0 grams at the hatchery and released into the Bulkley River system in May of 1994.

Table IV. Shocking and Picking Summary of 1992 Brood Bulkley River Coho Salmon Eggs at Toboggan Creek Hatchery.

Tray #	# of Females	Pre-Shock	Post-Shock	50 ml Sample	Volume (mls)	Survival (%)
M1-3	3.0	26	73	202(4.0)	2165	8587(98.9)
M1-4	2.0	65	260	163(3.3)	1975	6258(95.1)
M1-5	2.0	49	198	189(3.8)	1680	6186(96.2)
M1-6	3.0	78	390	168(3.4)	3130	10252(95.6)
M1-7	3.0	50	308	195(3.9)	2290	8623(96.0)
M2-3	2.0	12	43	188(3.8)	1925	7272(99.2)
M2-7	2.0	52	295	174(3.5)	1800	6005(94.5)
Total	17.0	332(0.6%)	1567(2.8%)	183(3.7)	14965	53183(96.6%)

Assessment of Coho Escapement in 1992

Toboggan Creek Fence

The Toboggan Creek coho counting fence commenced operation on August 06, 1992. The fence was monitorred twice daily from this date through to November 06, 1992 at which time the aluminum panels were removed for the winter.

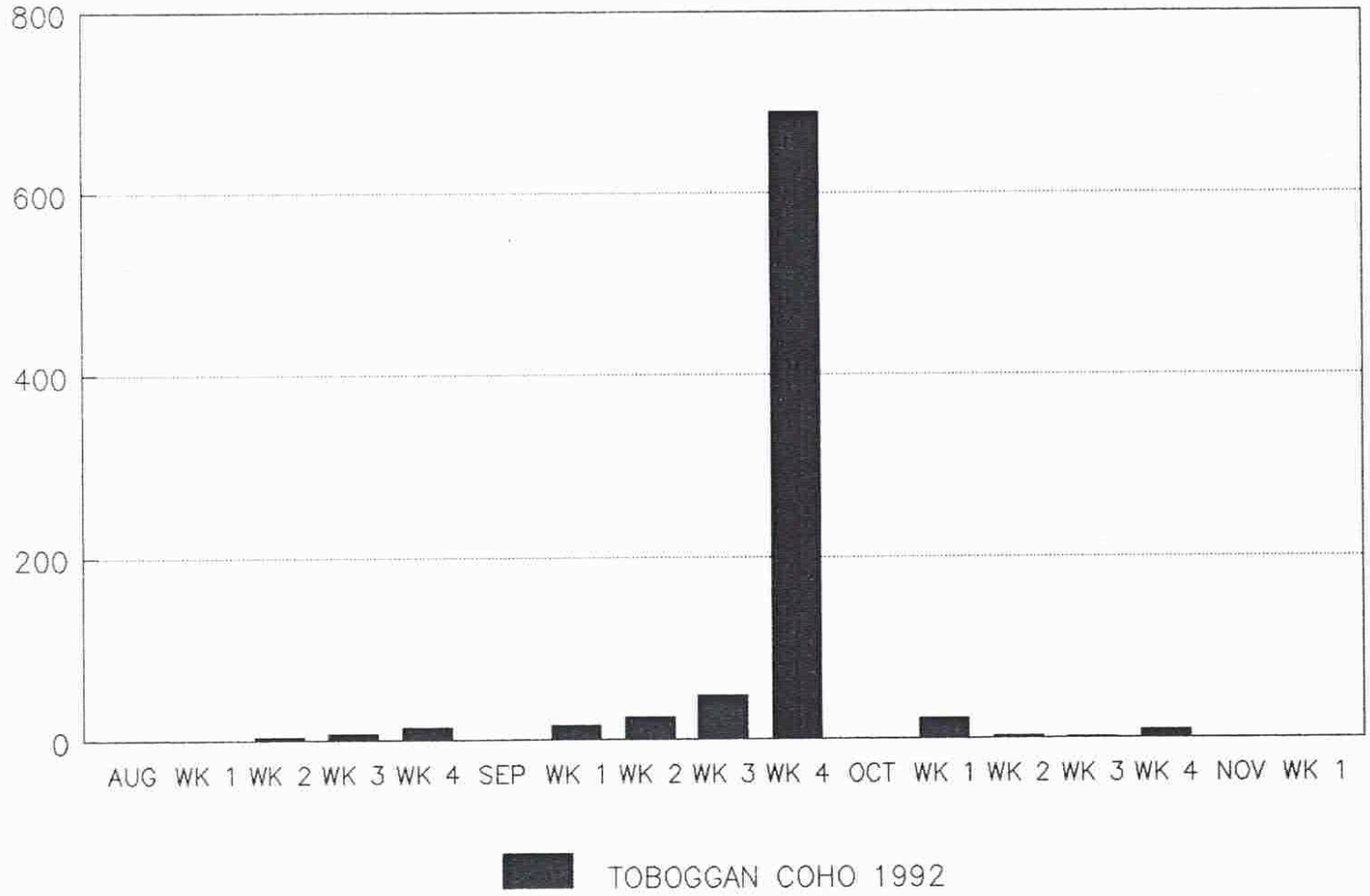
A total of 838 coho were passed through the fence with the period between September 21 and October 01 being the peak of migration into the creek (Fig. 5). It is quite apparent that the fourth week of September was likely when the majority of coho moved into the system and corresponded with peak water flows. Unfortunately the fence had to be laid down for over 50 hours on September 23rd, 27th and 30th due to high flows and most of these fish were not counted.

We were able to estimate the total number of coho which were in the creek by means of a mark/recapture study. Of the 838 coho passed through the trap we marked 827 by punching a hole in the right operculum. We followed up on this by sampling spawning coho by using a small mesh gillnet and counting both marked and unmarked fish captured. Of the 318 coho gillnetted 126 had been punched at the fence, with the remainder being unmarked. This clearly indicates an escapement 2.53 times larger than the actual marked count of 827 coho. Including the estimated 110 coho which spawned below the counting fence the total spawning escapement to Toboggan Creek in 1992 is in the area of 2,200 fish. This is the worst escapement we have documented since beginning fence counts in 1989.

Approximately 10.0 % of the coho handled at the fence were hatchery returns from the 1989 brood. This represents a total of 220 spawners returning from a release of 41,082 smolts, a 0.5 % return overall. Adipose-clipped coho showed slightly better survivals than ventral-clipped coho; of the 31,607 adipose-clipped coho released 176 returned (0.56%) while only 44 ventral-clipped coho returned from a release of 9,475 smolts (0.46%). This indicates a higher mortality of ventral clips as a result of reduced ability to escape predation.

Other fish observed during fence operation included 4 chinook and 8 steelhead, no pink salmon were captured or dead-pitched in 1992.

Fig.5 Estimated Run Timing
of 1992 Brood Toboggan Creek Coho



Coho Hatchery Returns (1989 brood)

Due to an extremely weak run of coho destined for the upper Skeena River tributaries, and because of heavy exploitation by the commercial troll and net fleets, the freshwater coho sportfishery was closed this fall. As a result sportfishermen in the upper Skeena were again deprived of benefitting from a very important recreational resource. In conjunction with the sportfishing closure the Indian food fishery and black market commercial fishery for coho continued unaltered.

As a result of the sportfishing closure no coded-wire tagged coho were turned in, and subsequently very little migration timing information was acquired in 1992. As well, despite a heavy harvest of coded-wire tagged coho by Indian fishermen, and huge amounts of funding to this group to assess the runs, no coho heads were turned in by this group. The only two coho heads turned in were by two independant poachers :

# of Coho	Tag Code
2	02/08/44

As a result of very poor escapements of marked hatchery coho to Toboggan Creek this year we were only able to collect 19 heads from coded-wire tagged fish in 1992. Of these 16 heads were found to contain pins :

# of Coho	Tag Code
4	02/08/43
5	02/08/44
7	02/08/45

These coho were all three year old fish from the 1989 brood.

Exploitation of 1989 Brood Coho

With groups of coded-wire tagged coho returning to Toboggan Creek, and with a counting fence installed on this stream, we were able to come to an accurate assessment of escapement of tagged coho in 1992. As well, coded-wire tag sampling of the B.C. commercial catch, Alaskan commercial catch, and B.C. sport catch give an indication of exploitation rates by each group. The Indian food fish catch has also been studied to some extent and gives insight as to coho harvested in 1992.

Coho catch and escapement estimates have been provided and/or corroborated by the following agencies and groups:

Escapement	-	Toboggan Hatchery/Fisheries and Oceans
B.C. Comm.	-	Fisheries & Oceans Canada
Alaskan Comm.	-	Alaska Department of Fish and Game
B.C. Sport	-	Fisheries & Oceans Canada/Toboggan Hatchery
Alaskan Sport	-	Alaska Department of Fish and Game
Indian Food	-	Toboggan Hatchery/Fisheries and Oceans

Exploitation rates indicated by this data suggest that coded-wire tagged coho from the Toboggan Creek stock were harvested at rates of approximately 66.0% in 1992 (Fig. 6). Commercial catches by Canadian and Alaskan vessels were responsible for over 83.8 % of the harvest, Indian food fishermen took 16.2 % of the catch, while sportfishermen had no kill in 1992. Coho spawning escapements to Toboggan Creek in 1991 were 34.0 % of the total adult stock.

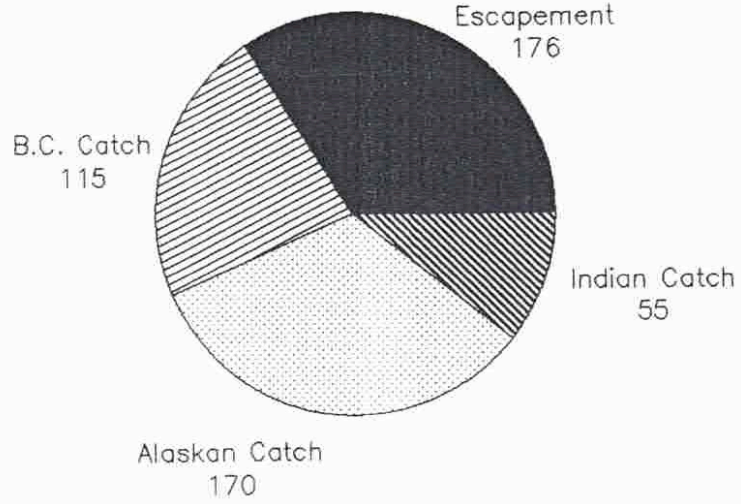
Alaskan commercial fishermen caught more coho than those that were reported by B.C. fishermen, with 170 and 115 coded-wire tagged Toboggan coho respectively. Over 76.0 % of the Alaskan catch was by troll fishermen while Canadian catches of these coho were 27.0 % troll and 73.0 % net. Indian fishermen took an estimated 55 tagged coho while sportfishermen caught none.

Assuming these exploitation numbers document the entire catch it becomes apparent that smolt to ocean adult survivals are about 1.6 %, less than a quarter of last year and well below assumed survivals for the south coast of British Columbia. It may indicate that upper Skeena coho stocks have a much lower rate of productivity than what has been previously accepted.

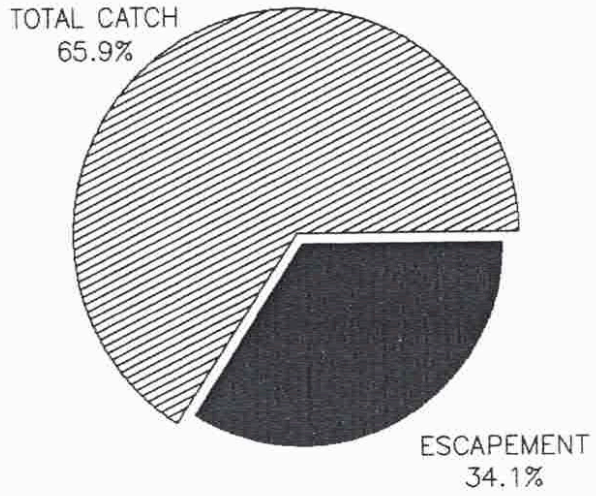
Given the fact that recommended <u>maximum</u> exploitation rates on the south coast of B.C. are documented at <u>65.0 %</u> it would appear that a 66.0 % exploitation of a less productive stock of coho would not be in the best interests of conservation.

Fig.6 Total Coho Catch (1992)

Toboggan Creek Hatchery C.W.T.'S



CATCH/ESCAPEMENT



EXPLOITATION RATE

Administration Report

As this report is being written before completion of my final progress claim the following figures represent only estimates of where we will be at that time. It appears we will be right on our total budgetted amount of 166,300.00 for 1992/93, as per our contract administered through the federal Department of Fisheries and Oceans.

The following is a breakdown of hours spent carrying out the contract in 1992/93:

Activity	Man-hours
Project Management	1106.0
Facility Operations	3589.0
Broodstock Collection	340.0
Assessment	402.0
Coho Fence	374.0
Statutory Holidays	224.0
Total Hours in 1992/93	6035.0

The contract went very well in 1992/93 and our hours spent by category were fairly consistent with last year. Approximately the same amount of time was spent operating the facility and maintaining the hatchery and grounds. Less time was spent in managing the project while the assessment of coded-wire tag returns of chinook and coho to the Bulkley River and Toboggan Creek took about the same amount of time as in 1991/92. As a result of lowered egg targets, specifically the cancellation of the Morice coho program, it took less manpower to achieve our goals. The coho counting fence took more of our time this past year, although the fence was removed at about the same time it was installed much earlier than last year. In total, labour hours were very similar to 1991/92, being 4.0 % lower this year than last.

Total employment generated by the hatchery in 1992/93 was 150 work weeks, employing 11 different people for varying lengths of time.

Labour costs were almost exactly on budget this year. Costs for Operations and Maintenance were also very close to the budgetted amount, despite the fact that the cost of replacing the channel abutments was approximately $5,000.00 more than expected. As well, expenditures for Travel and Living were in close proximity to the amount budgetted for this fiscal year.

The following is a summary of expenditures made in carrying out the 1992/93 contract:

Category	Expenditures	Contract
Direct Labour	85,325.00	85,458.00
Overhead Costs	21,331.00	21,364.00
Capital Equipment	0.00	0.00
Operations & Maintenance	37,794.00	37,251.00
Travel and Living	21,850.00	22,227.00
Totals	166,300.00	166,300.00

The labour and overhead portions of this table do not include approximately $2,600.00 for the Challenge '92 student program funded by C.E.I.C.

Development and Maintenance of the Facilty

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

i.) The wooden abutments in the outdoor rearing channel were replaced in June of 1992. The old abutments were made of untreated wood and were rotting, the new ones are made of pressure-treated wood and should last more than twenty years. Hatchery personnel assisted D.F.O. engineer Pat Cochrane on this project which took the better part of three weeks to complete.

ii.) The settling pond was dredged again to remove the sand that accumulates at the end of the inflow pipe. This has become an annual maintenance procedure and we try to remove the buildup before it becomes a problem.

iii.) The creek intake again took a great deal of effort to maintain in 1992/93. The flooding experienced during October of 1991 moved the main channel of the creek so that it was on the opposite bank of the intake screen. Although we applied in March of 1992 to carry out some instream maintenance it was not until October that the work was approved, too late as the coho were beginning to spawn in the creek. As a result we have had to keep up with our daily maintenance until the next window in August of 1993.

iv.) Four students were hired for 3 weeks during the summer as a result of funding from the federal Challenge '92 Program. These students were instrumental during the summer period in providing public tours and in manning the hatchery during chinook broodstock collection. We again had over 2000 visitors tour through our facility in 1992/93.

Operating Plan for 1993/94

As in previous years we will begin releasing the chinook and coho smolts in April and May. The 1991 brood Bulkley chinook will be the first to go in mid to late April, followed later by the 1991 brood Toboggan Creek coho which go out in May. As in past years we will enumerate all salmon smolts while they are being loaded into the transport tanks. We will be taking over 50,000 salmon smolts to the Bulkley River and more than 30,000 smolts will be released into Toboggan Creek as well. In addition, 10,000 coho smolts from the Toboggan stock will be transplanted into Kathlyn Creek in late May. Releases may take two to three weeks to complete.

Our Society discontinued working with steelhead in 1991/92 as a result of a lack of funding and interest by the Province of British Columbia's Fisheries Branch. With the release of the steelhead yearlings from the 1990 brood our program ended. In 1990 we initiated a cutthroat enhancement program in Kathlyn Lake near Smithers, B.C. We presently have 700 two year olds rearing at an off-site location, we are now contemplating an adult broodstock program for these 105.0 gram trout.

Our chinook target has been raised to 100,000 eggs to allow for a c.w.t. release group of 80,000 smolts for the next few years. Egg collection will happen in late August and we plan to produce 15.0 gram smolts for release in April of 1995.

Coho egg targets have been reduced from 230,000 eggs in past years to 100,000 for 1993; Bulkley River (50,000), Toboggan Creek (37,000), and Kathlyn Creek (13,000). The Morice River program was discontinued in 1992. These coho will be reared to smolt size, 12.0 to 15.0 grams, and released in the spring of 1995.

We will continue with our assessment activities with the coho counting fence on Toboggan Creek and will attempt to install the panels sometime in April this year, in an attempt to get a count on steelhead spawners. We will again do a marking and recapture study to back up the fence counts for coho.

As well, we will attempt to keep the public in this area well informed of our activities, goals and accomplishments in the area of fish culture on the Bulkley/Morice system.

Recommendations

All aspects of our operation went very well in 1992/93, again our egg to fry and fry to release survivals were quite good. There are, as usual, some areas where I believe we can make some changes that will be beneficial to our operation :

i.) We would still benefit from the aquisition of a large transport tank for release of our salmon smolts. The existing tanks require an inordinate amount of time with their small carrying capacity. A tank capable of accommodating 20,000 smolts at 15.0 grams would be of great value and allow us to release a greater number of these smolts at the peak of wild smolt migration.

ii.) Assessment of returning coded-wire tagged chinook and coho salmon would be greatly improved if we could get some accurate data from the Moricetown Indian fishery in July and August. Each year tens of thousands of salmon are landed by this Indian band at Moricetown Falls on the Bulkley River. In the past two years we have observed many clipped hatchery fish in the catch at Moricetown Falls. A coordinated assessment program would provide an abundance of relevant information on stock timing and survival. As well, a move away from gaffing, and the high wounding rates, to a selective method would put many more fish on the spawning beds. Co-management funding has been provided to this band for the past two years for this type of progress, to date virtually nothing has been accomplished.

iii.) As in 1992, I would recommend that coded-wire tagging of our chinook smolts occur in mid June with the coho being tagged in early to mid August. This will allow us to keep salmon pre-marking densities at acceptable levels and reduce the amount of stress on the fish.

iv.) We are very dependant on the abundance of broodstock to supply us with the eggs to enhance each specific stock we work with. I would recommend, and hope, that ocean harvests in 1993 will be restricted so that our enhancement goals can be realized. Coho returns to some tributaries may be extremely low in 1993 and we feel that adequate spawning escapements of the upper Skeena coho must be the primary management goal! As well, upstream users of the resource should be given more consideration when determining what escapement levels should be in future years. Catch data of coho coded-wire tags from this facility show these stocks are being heavily overexploited to their detriment.

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 1,859,168 salmon and steelhead smolts and fry. We have seen good returns of hatchery chinook and coho to the Bulkley and Toboggan systems over the past few years and this reinforces our resolve to continue with this worthwhile work. The coho counting fence which we operate on Toboggan Creek is allowing for a better understanding of coho smolt to spawning survivals on interior systems in Northwestern B.C. Along with coded-wire tag recoveries from the commercial operations from B.C. and Alaska it should now be evident at what rate these coho stocks are being exploited, and whether catch reductions are necessary.

Our Society is very appreciative for the opportunity to be part of the salmon enhancement program in northwestern B.C. We also appreciate the support we receive on a yearly basis from various people from the Community Involvement Division, the Resource Restoration Unit and many other factions of the Salmonid Enhancement Program and the Department of Fisheries and Oceans.

Within the scope of our operations perhaps the most valuable support we receive is from the local people of the Bulkley Valley. During our broodstock collection and smolt releases we quite often receive volunteer support from individuals in our local communities. From school students to members of our own society, many hours are annually donated for the benefit of the resource. The many tourists and locals who stop by for a tour of the facility are very supportive of our operations and this in itself is rewarding to us, public awareness very definitely is increasing and we see it year to year.

We look forward to our continued involvement with the program in the future!

Mike O'Neill, Hatchery Manager

TOBOGGAN CREEK SALMON & STEELHEAD ENHANCEMENT SOCIETY
R.R. # 1, SMITHERS, B.C., CANADA V0J 2N0

APPENDIX "A"

Statement of Work - 1992/93

ATTACHED IN FIVE PAGES

4. FACILITY IMPROVEMENTS

If funding permits, new rearing channel dividers and bank stabilization along with intake maintenance.

5. REPORTING REQUIREMENTS

Monthly reports of biological activities including brood stock, incubation and rearing summaries as well as training, pertinent unscheduled events and areas of concern.

6. PRODUCTION PLAN

1990 Toboggan Creek Coho

- continue rearing of the 47,000 fry and release to Toboggan and Chicken Creeks at smolt in May of 1992. Release as discussed with planning team.

1990 Upper Bulkley Coho

- continue rearing of the 78,000 Upper Bulkley Coho and transport and release in May of 1992 to appropriate locations along the Upper Bulkley River.

1990 Upper Bulkley Chinook

- continue rearing of Chinook until release time in the Spring of 1992 at approximately 15.0 grams. Enumerate upon release and transfer back to Upper Bulkley River and release to appropriate locations. Release sites to be determined at this time depending on watern quality and flow.

1991 Upper Bulkley Chinook

- continue incubation of 60,000 eggs and pond into rearing troughs upon button-up stage of development. Initiate feeding. Transfer to outdoor rearing channel in late Spring. To be released in Spring of 1993.

1991 Toboggan Creek Coho

- continue incubation of 62,000 eggs and pond at button-up into rearing troughs. Initiate feeding.

1992 Morice River Coho

- collect approximately 100,000 eggs from Morice R. stock and incubate until the "eyed" stage when they will be "shocked", "picked" and transfered to Kitimat Hatchery for final incubation and rearing. Record all data.

1992 Upper Bulkley Coho

- collect approximately 80,000 eggs from this stock and incubate in "moist" incubation system until "eyed". "Shock",remove mortalities and enumerate using standard sub-sampling procedures. Final incubation will be done in vertical incubators. Record all data.

- clean incubation containers thoroughly prior to loading of eggs.
- organize and disinfect all associated equipment.
- monitor and record data relevant to the incubation of eggs at the hatchery (i.e., water flow, water temperature, dissolved oxygen, etc.).
- maintain proper water flow to the incubators at all times.
- check the pipeline and screen daily and clean if necessary.
- record accumulated thermal units (ATU's) on a daily basis.
- shock, pick, count and provide numbers of mortalities and live eggs at the eyed stage of development.

7.3 REARING

- prepare troughs for emerging fry by cleaning rearing containers thoroughly prior to use, etc.
- organize and disinfect all associated equipment.
- pond all 1991 brood fry at button-up into rearing containers.
- enumerate all fish before transfer and prior to release using standard sub-sampling techniques.
- feed all juvenile fish as per feed rates specified by the feed manufacturer or by DFO support staff.
- rear fish using 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 behavior, disease, etc.
- maintain fish health and treat fish health problems as directed by DFO support staff.
- maintain the rearing facility in a safe, organized and sterile conditions.
- release fish at appropriate times and techniques as directed by DFO support staff.

8. TRAINING

- due to budget constraint, training will be minimal during the 1992/1993 fiscal year.

- Provision will be made in this contract to enable regular facility personnel to receive on-site training and instruction 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 mini-workshops on all aspects of the contract. In addition, the Project Manager should maintain records showing all training completed and further training required for each employee.

9. 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 fullfilling the contractual obligations to the satisfaction of the DFO Departmental Representative. 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 Resource Restoration Unit support staff when appropriate as determined through consultation with the Project Manager, the Project Advisor and the DFO Departmental Representative.